D-08
SCON

LONG RANGE FACILITY PLAN

FOR

ETERSON BUILDERS,INC.

PETERSON BUILDERS, INC.

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
22 FEB 1982	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Long Range Plan for Peterson Builders, Inc.	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Naval Surface Warfare Center CD Code 2230 - Design Integration Tools Building 192 Room 128 9500 MacArthur Bldg Bethesda, MD 20817-5700**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**SAR**	**117**	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

LONG RANGE PLAN

for

PETERSON BUILDERS, INC.

A Report

prepared for

Peterson Builders, Inc.

Sturgeon Bay, Wisconsin

By

Shibbuilding Consultants, Inc.

Dickinson, Texas

22 February 1982

J. Niel Spillane
Gardner I. Parsons

Frank H. Rack
President

Shipbuilding Consultants, Inc.

LONG RANGE PLAN

for

PETERSON BUILDERS, INC.

Sturgeon Bay, WI 54235

Plan ?period 1980 - 2000

Prepared by: **Shipbuilding consultants, Inc.**

202 W. Bayou Drive

Dickinson, TX 77539

(Messrs. Frank H. Rack, Gardner I. Parsons,

J. Niel Spillane)

In conjunction with the management of Peterson Builders

approved: E.L. Peterson, President PBI

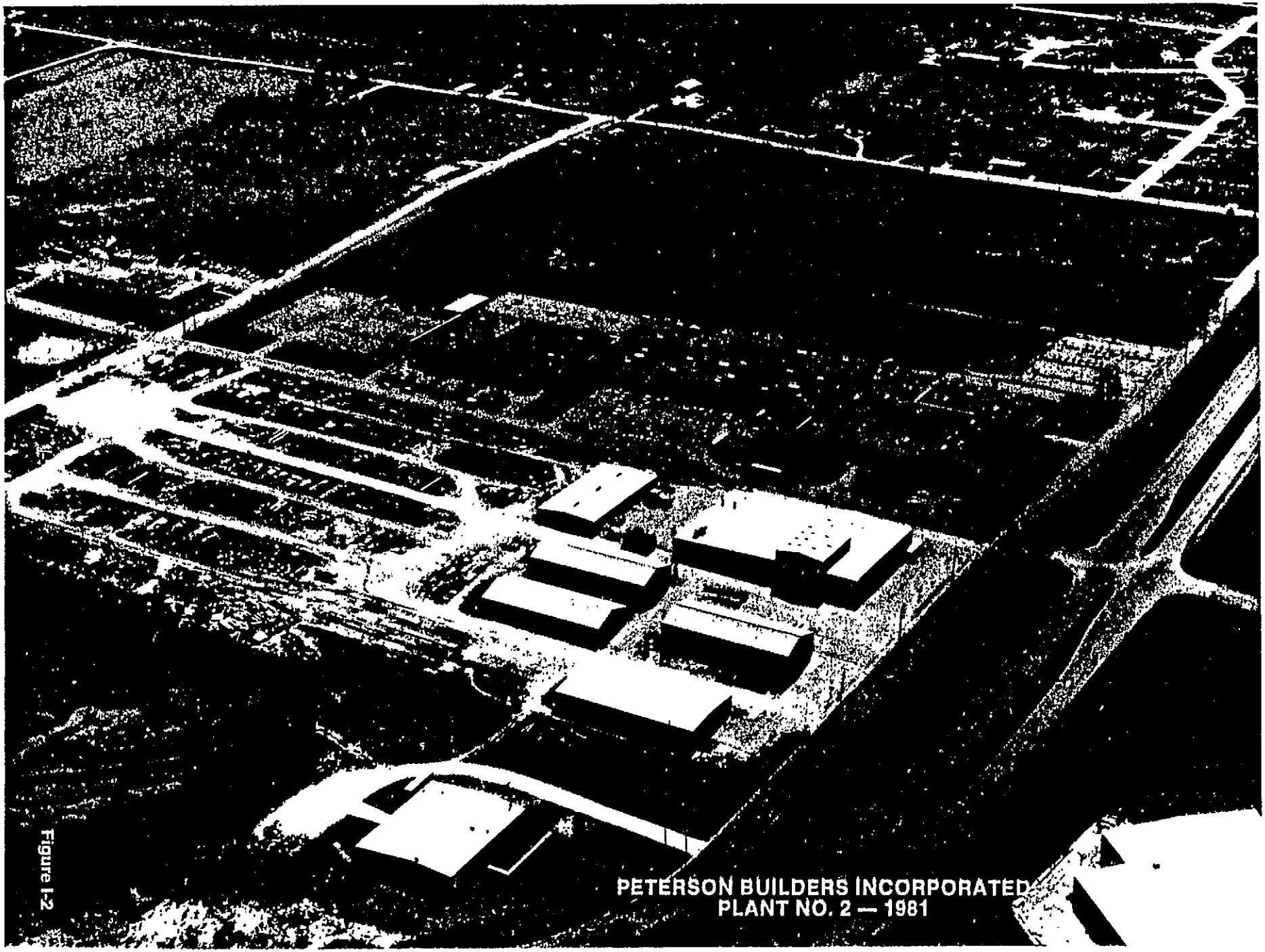
Issued:

Revised:

TABLE OF CONTENTS

PETERSON BUILDERS INCORPORATED — 1980

Figure I-1



PETERSON BUILDERS INCORPORATED
PLANT NO. 2 — 1981

Figure I-2

I. MANAGEMENT SUMMARY

Early in 1980, Peterson Builders, Inc. (PBI) of Sturqeon Bay, Wisconsin together with several other American shipbuilders, agreed to proceed with the development of a Facilities Long Rnge Plan for their companies, consistent with a "Consensus Outline" which had previously been developed by an advisory ccmmittee under U.S. Maritime Administration (MarAd) supervision. The intent of the consensus outline was to provide some consistency between the several long rage plans particularly in those areas where the Potential for MARAD financial assistance Might require ccnparative evaluation. Further, MARAD anticipates that the standardization of long range planning by U.S. shipbuilders can offer an improved assessment of the wartime mobilization potential of the industry. peridicallv since the inception of the plan development, reports have been advanced at tlhe MARAD SP-1 Panel meetings to provide the participating shipyards with an insight into the progress and problems the yards have had in proceeding with tne project. PBI prcqress reports were given at the meetings held on 5 February 1981 at National Steel and Shipbuilding Company, on 20 August 1981 at Norfolk Shipbuilding and Drydock Corqmny and on 7 April 1982 at MarAd, Washigton, DC.

To ease the wcrkload on its busy management and to secure additional experience in long range business and facilities planning, PBI secured the services of a consultant, Shipbuilding Consultants, Inc. (SCI) of Dickinson Texas to assist in the preparation cf the plan. Preliminary investigations were started in April 1980 and were directed toward an understanding of the PBI market and competition, physical, financial and labor constraints on

complex ships produced before 1980. Concurrently the yard was called on to manage and construct both a major government and a major commercial product line.

Since initial investigations rapidly established that the PBI facilities were basically adequate to meet in-house contractual commitments. Further investigations were directed toward the production functions and those prerequisite material and engineering actions whiCh would insure that PBI met its short range ship delivery ccmmitments. These investigations concentrated on highlighting the strengths and weaknesses of the PBI systems used to document, control and report on the proqress and completion of engineering output, material deliveries and production work and further on the organization and understanding of Production management role in achieving its contractual commitments. From these studies PBI management concluded that immediate changes in production organization and in production control proceures would materially assist in responding to the massive contract changes being received on the PGG program and in meeting its ship delivery schedules. These short range changes are described in detail in Secticn V-C. For approximately six montins, to insure implementation of these changes in a timely manner, the consulting team was assigned to manage the Plannig and Production Control (PPC) department and defer efforts on the long range plan.

The insight that was gained in resolving the company's short term prcblems set the stage for developing a plan for the Salvage Ship (ARS) and Mine Countermeasure (MCM) ship programs. The Short, Intermediate and Long Range sections of the plan are discussed in detail in Sections V-F and V-G. Briefly these include:

Facility modernization to increase the number of building berths and pier space, and provide larger ship assembly buildings with better access to and from the launching areas.

Improved production control, scheduling, and zone outfit techniques to achieve increased productivity frcm the maximum work force allowed under the Small Business ceilings.

Introduce comprehensive strategic and mrket planning to optimize bidding decisions axd improve PBI market position.

Develop a comprehensive management control, reportig and information system which can also demonstrate auditable compliance with the Department of Defense Cost Schedule Control System (CSCS) requirements.

Establish a plan for handling management attrition and succession and retention of Petersen family Control in a growing company through strengthening of the line management organization.

II. MISSION STATEMENT

The PBI shipyard is located in Sturgeon Bay, Wisconsin and shipbuilding is expected to remain the predominant activity of the Ccmpany's long range business plans. Since 1933 “the PBI’s major dedication has been to shipbuilding and to maintaining a balance between government and commercial contracts. PBI has established a preeminent position in the construction of mine warfare ships and patrol boats for the U.S. Navy and has become a major factor in construction of tuna superseiners. Since many of these contracts require that awards be made to shipyards which meet government SBA guidelines, the ccmpany intends to stay below the SBA manpower ceiling and balance the labor intensive government contracts with space intensive ccmmercial work. Industrial product work will only be sought to offset labor cycles in key skilled trades.

The mission priorities of the shipyard then are:

1. maintain and enhance Peterson’s position as the preeminent U.S. minecraft and mid-size combat vessel builder.

2. Consolidate Peterson’s strong tuna seiner position into leadership in medium sized comercial vessels.

3. Constructively and profitably employ all of the skilled work force within the SEA ceiling.

4. Make effective use of the existing facilities and improve its efficiency to allow greater capacity without expanding the labor force.

5. inprove efficiency to guarantee an adequate profit base to create an attractive profit sharing plan for the company and its employees.

III. PRIMARY OBJECTIVES AND GOALS

A. Marketing Objectives and market share

In nearly a half century that the Peterson family has pursued Shipbuilding in Wisconsin, it has become apparent to the industry the that the cmpany can produce excellent ships while maintaining a competitive position in seeking small and medium sized ships for the government or comercial interests in either steel, aluminum, wood or fiberglass. The ability of the mnagement and work force to handle not only a broad range of ship sizes up to 300 feet in length but to shift easily to a variety of shipbuilding materials, has placed PBI in a strong competitive and marketing position. This strong Position has also enabled the Peterson family to pursue several interesting personal goals, not the least of which is to maintain their role as the sole remaining U.S. Navy minecraft builder. Their design and construction abilities to produce "unusual" commercial ships to which they can apply their skilled work force also places PBI in the forcefront of American shipyards.

As a builder deep withtin the Great Lakes inland system, PBI must continue to offer cost, schedule and quality incentives to its customers to allow it to compete successfully with builders which are geographically closer to its customers. Historically they have been successful in doing this.

Altlmugh PBI enjoys some competitive advantage with its in-house experience in all the principal shipbuilding materials together with a multi-skilled work force, it also suffers some disadvantage in that it

must strive to secure some balance in its work load in these materials to avoid loss of these skills or unused resources.

With these stipulations in mind, PBI visualizes its future market strengths in some or all of the following ship categories:

1. U.S. Navy minecraft.
2. Aluminum ships, government and commercial, 50 to 200 feet or longer.
3. Commercial fishing vessels, steel or composite to 300 ft.
4. Small to medium sized steel government combat or auxiliary ships .
5. Unusual prototype vessels in the above size ranges (for example; Polar research ships)
6. SWATH, catamaran, surface effect, hydrofoils and similar ships.
7. Dredges.
8. Amphibious vehicles.
9. Selected ship repair.
10. Fiberglass or wood boats and ships in the 30 to 200 foot range.

In addition PBI has acquired considerable experience acting as Central Procurement Agent for U.S. government and foreign clients to furnish expertise in buying and shipping repair parts, machinery and related consumables. This effort is made possible through PBI’s experience in a wide variety of naval and commercial snips and to use of computerized prcocurement methods which allow expeditions processing and timely delivery of

thousands of items. PBI intended to expand this service to become a major profit center.

Within the limitations of the SBA ceiling and anticipated capacity increase in the order of 15% to 20% due to planned efficiencies now underway, PBI looks forward to a penetration of this market in the order of fifty percent on each major program bid. If the Department of Defense (DOD) should significantly increase the scope of its shiplbuilding programs within this market range, PBI will have two suitable alternatives, either of which will allow it to maintain its Company mission. First it can concentrate on one or more of the best products (best in terms of implementing its "mission") while remaining Within the SBA ceiling, or it can temporarily abandon its pursuit of SBA contracts and secure a larger market share with an expanded work force. Either course can be follwed but the latter may require more facilities modification to accomdate the larger work force. For the foreseeable future, PBI has decided to remain a Small Business.

B. New Product Developments

Historically PBI's approach to new product development has been to search out unconventional and unusual ships designed by others which require sophisticated construction skills and management and then become the principal builder of this ship type. The Peterson family remains dedicated to this approach and a number of unusual ship types such as catamarans, SWATH ships (Small waterplane Area Twin Hull), hovercraft,craft, air cushion vehicles, dredges and research vessels are being studied.

IV. CORPORATE HISTORY AND DEVELOPMENT

PBI has been building boats and ships at Sturgeon Bay, Wisconsin (See Figs IV - 1, 2 and 3) , continually since 1933, almost a half century of successful construction in wood, steel, aluminum and fiberglass. Its founder Mr. Fred J. Peterson, had an even earlier experience in boatbuilding, assisting his father, Martin Peterson, prior to and during World War I at the nearby Peterson Boat Works which was destroyed by fire in 1918. Subsequently Mr. Peterson shared and expanded his knowledge of shipbuilding at the nearby L.D. Smith Shipyard and Sturgeon Bay Boat works. He established the present Company in 1933 initially constructing commercial boats (see Fig. IV-4) and receiving its first government contract in 1939 to build 40' motor whale In 1940 additional contracts were awarded to build 110’ wooden subchasers for the U.S. Navy and Air/Sea Rescue boats (PT type) for the U.S. Army. Subsequent to World War II, the yard preceded with the construction of a variety of commercial craft including sightseeing boats, steel fish tugs and fine sailing yachts but during the period commencing in about 1950, the Petersons were principally involved in all manner of small to medium size ships for the government (see Fig. IV-5). These included a great variety of minesweepers from the 50' MSB, 110' MSI, 145' MSC, 165' MSO and 195' MSO, and also fiberglass 33’ and 40’ personnel and utility boats, aluminum and steel motor gunboats from 50’ to 165’ and a collection of interesting unusual ships in the same size ranges. Of particular note were the 244’ aluminum ALCOA SEAPROBE, the 235’ State of Alaska ferries LE CONTE and AURORA, two 300’ heavy Lift Roll On/Roll Off (RO/R3) vessels, 177’ research vessels WECOMA for Oregon State University, OCEANUS for Woods Hole Oceanqraphic and ENDEAVOR for

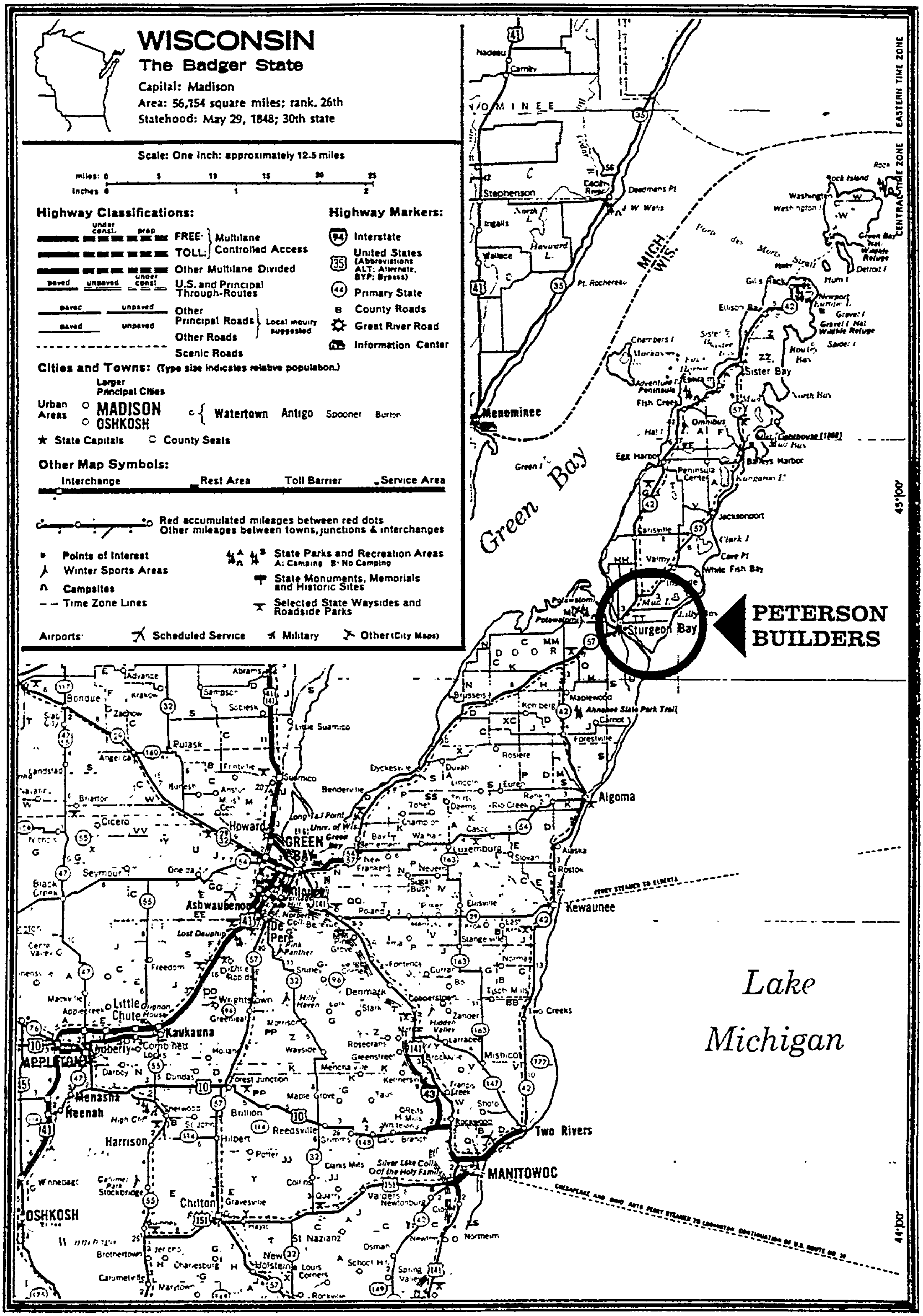

WISCONSIN
The Badger State
Capital: Madison
Area: 56,154 square miles; rank, 26th
Statehood: May 29, 1848; 30th state
Scale: One inch: approximately 12.5 miles
Highway Classifications:
FREE
TOLL
Multilane Controlled Access
Other Multilane Divided
U.S. and Principal Through-Routes
Other Principal Roads
Other Roads
Scenic Roads
Highway Markers:
Interstate
United States
Primary State
County Roads
Great River Road
Information Center
Cities and Towns: (Type size indicates relative population.)
MADISON
OSHKOSH
Watertown
Antigo
Spooner
State Capitals
County Seats
Other Map Symbols:
Interchange
Rest Area
Toll Barrier
Service Area
Red accumulated mileages between red dots
Other mileages between towns, junctions & interchanges
Points of Interest
Winter Sports Areas
Campsites
Time Zone Lines
State Parks and Recreation Areas
State Monuments, Memorials and Historic Sites
Selected State Waysides and Roadside Parks
Airports
Scheduled Service
Military
Green Bay
Lake Michigan
PETERSON BUILDERS
Sturgeon Bay
Menominee
Algoma
Kewaunee
Two Rivers
MANITOWOC
GREEN BAY
Kaukauna
APPLETON
Menasha
Neenah
OSHKOSH
Chilton
Sister Bay
Jacksonport
EASTERN TIME ZONE
CENTRAL TIME ZONE

Figure IV-1

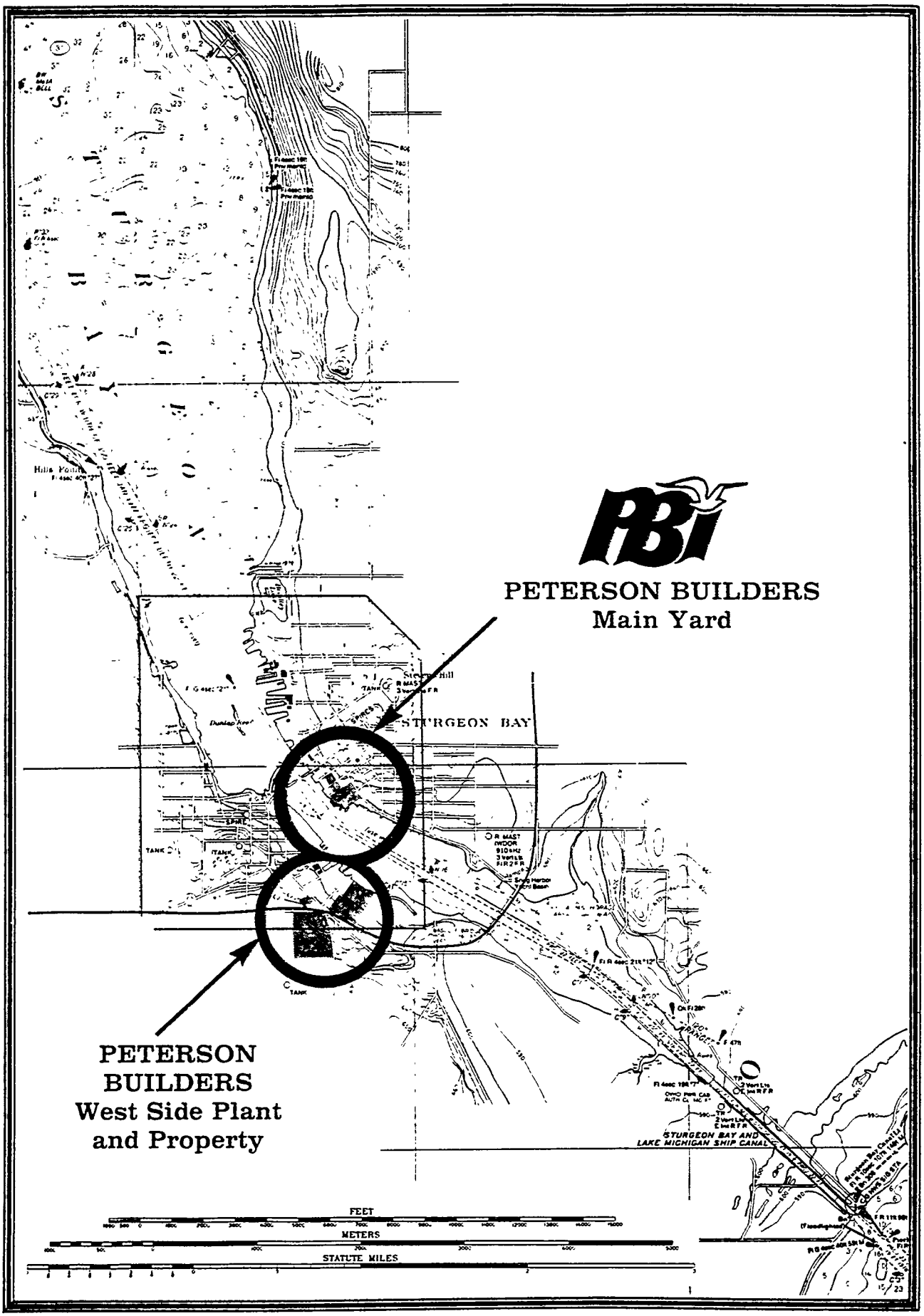
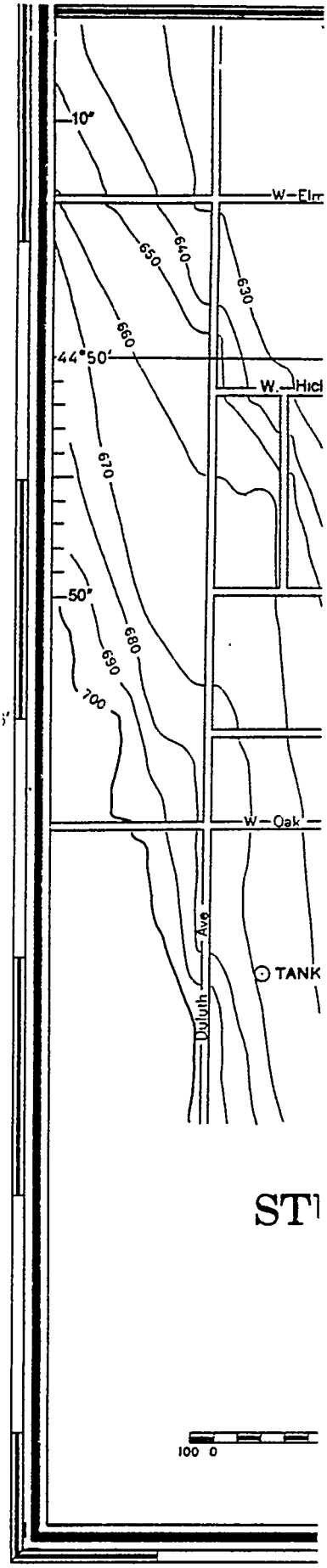

PETERSON BUILDERS
Main Yard
PETERSON
BUILDERS
West Side Plant
and Property
STURGEON BAY
STURGEON BAY AND
LAKE MICHIGAN SHIP CANAL
FEET
METERS
STATUTE MILES

Figure IV-2


10"
W-Elm
650
640
630
660
44°50'
W.-Hic
670
50"
680
690
700
W-Oak
Ave
Duluth
TANK
100 0

PETERSON BOAT WORKS
1936

Figure IV-4

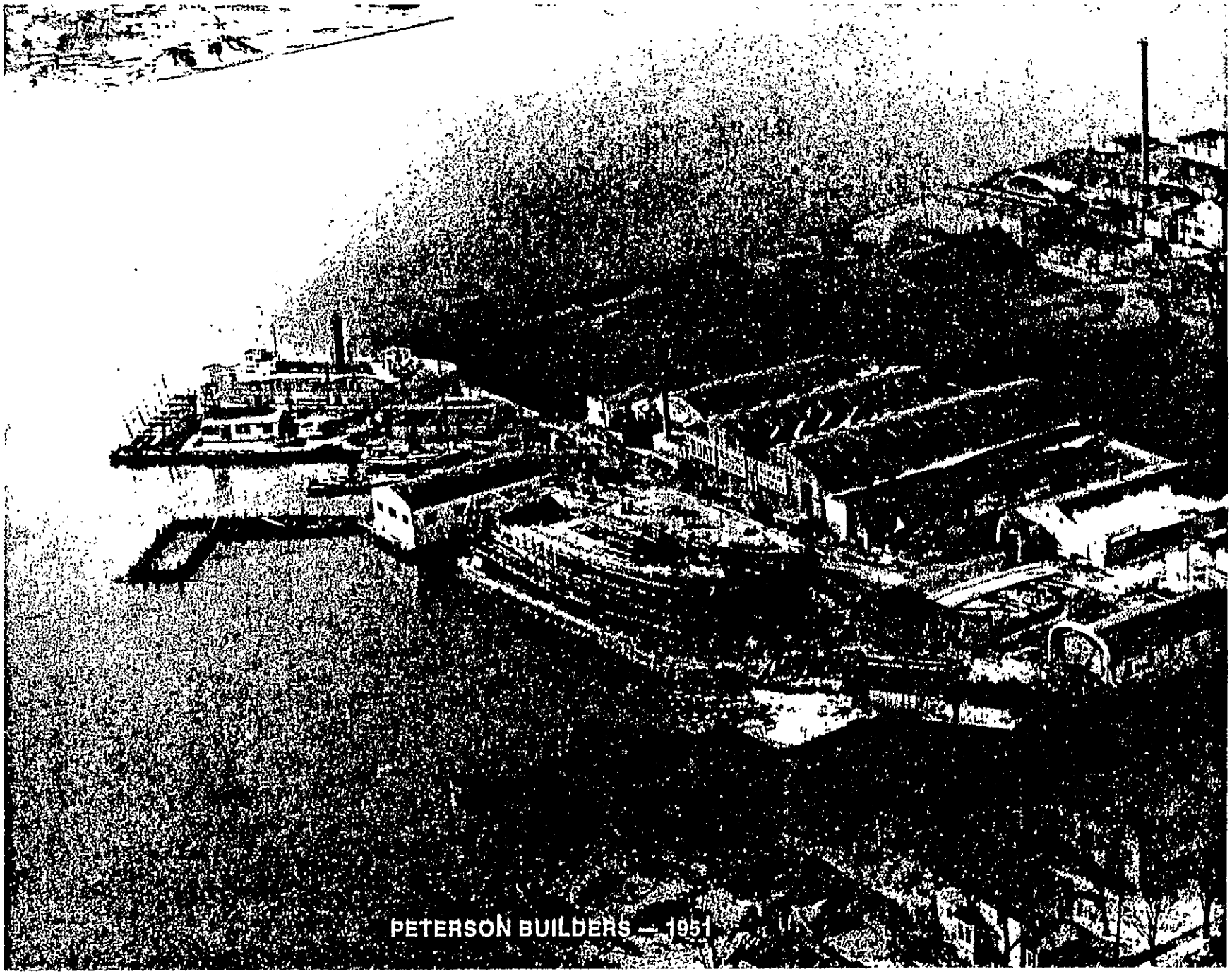
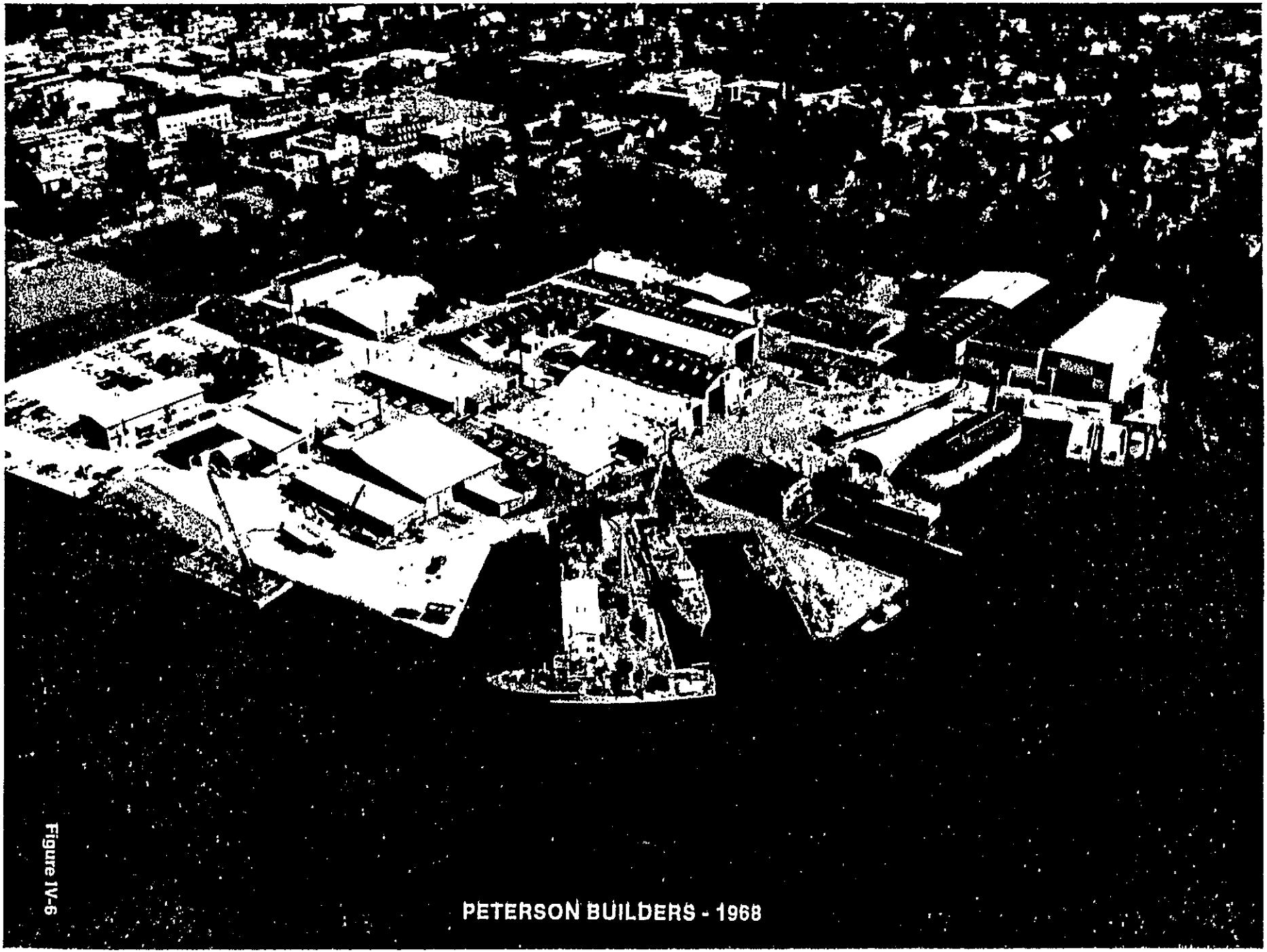


Figure IV-5

University of Rhode Island, a 145' tug JAMIE A. BAXTER as a part of an integrated tug/barge unit for CF Industries and a 262' tuna seiner. Also a quantity of 50 foot aluminum boats were constructed In conjunction with a private Mid East shipyard. This experience has paved the way for the current building programs which include nine U.S. Navy PGG type 192' gunboats for the Saudi Arabian navy and many 225' tuna seiners of a 1200 ton class for several owners. (For details see Appendix - standard Form 17.)

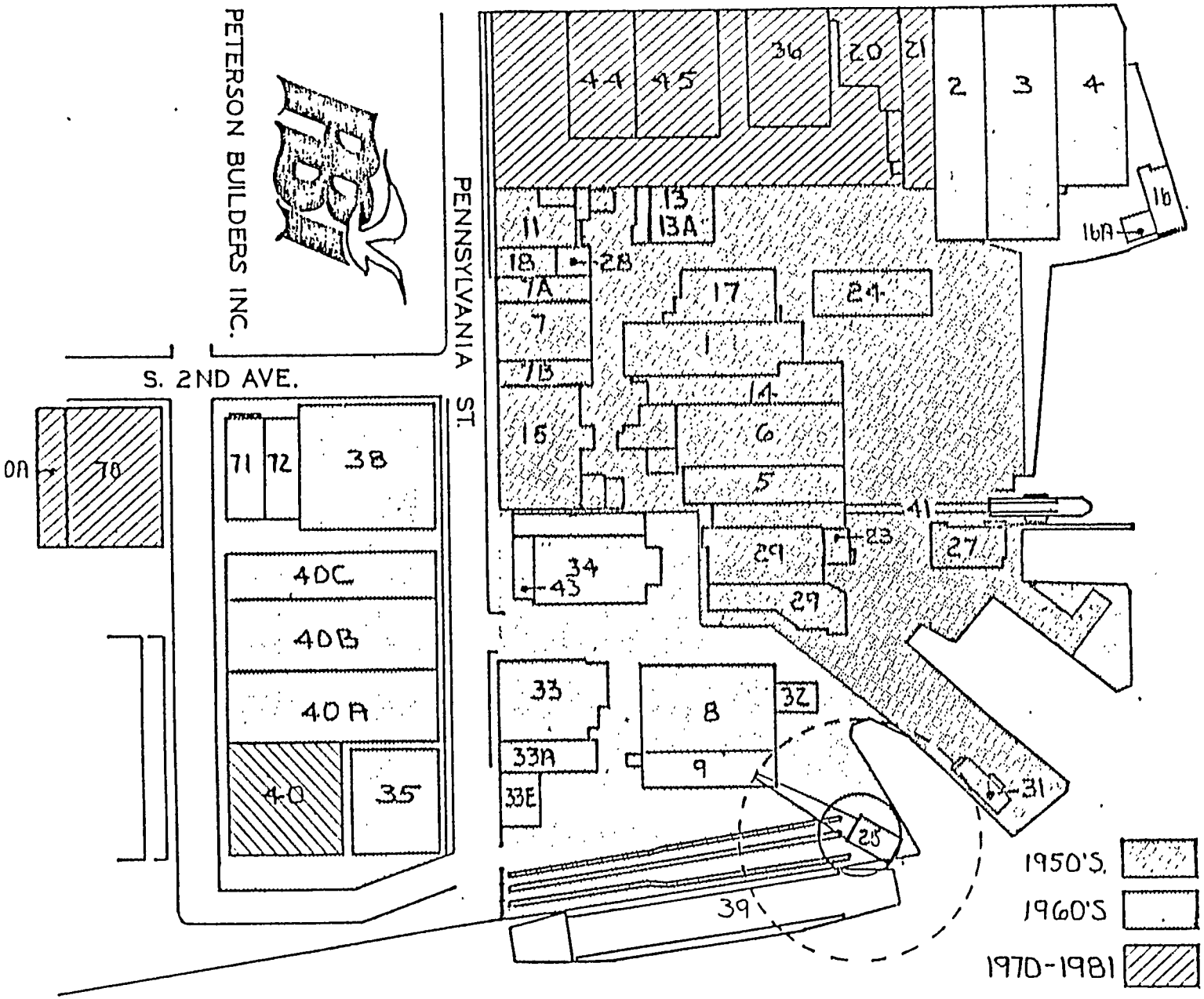
The Peterson Builders shipyard has occupied essentially the same property on the northeastern shore of Sturgeon Bay nearly adjacent to Martin Petersons original boat yard and the shipyard remains a business closely held by the Peterson faiily. The sons of Fred J. Peterson, Ellsworth and Robert, are active as President and Executive Vice-President respectively. In about 1966 the company acquired roughly four acres of land and buildings from a fruit packing company which was used to improve the utility and layout of the PBI production facilities (see Fig IV-6). The shipyard now encompasses 13 acres in the east side main yard and 20 acres in the outlying manufacturing and warehouse areas in other parts of Sturgeon Bay. (See Fig. IV- 7)

Most of the ship construction is conducted within covered and heated assembly buildings (see Appendix - Yard Plan) The yard has an 1800 ton 342’ X 40’ floatirq drydock, plus two outside building positions for ships to 300’ long, and a variety of qantry and mobile cranes with ratings to 200 tons.



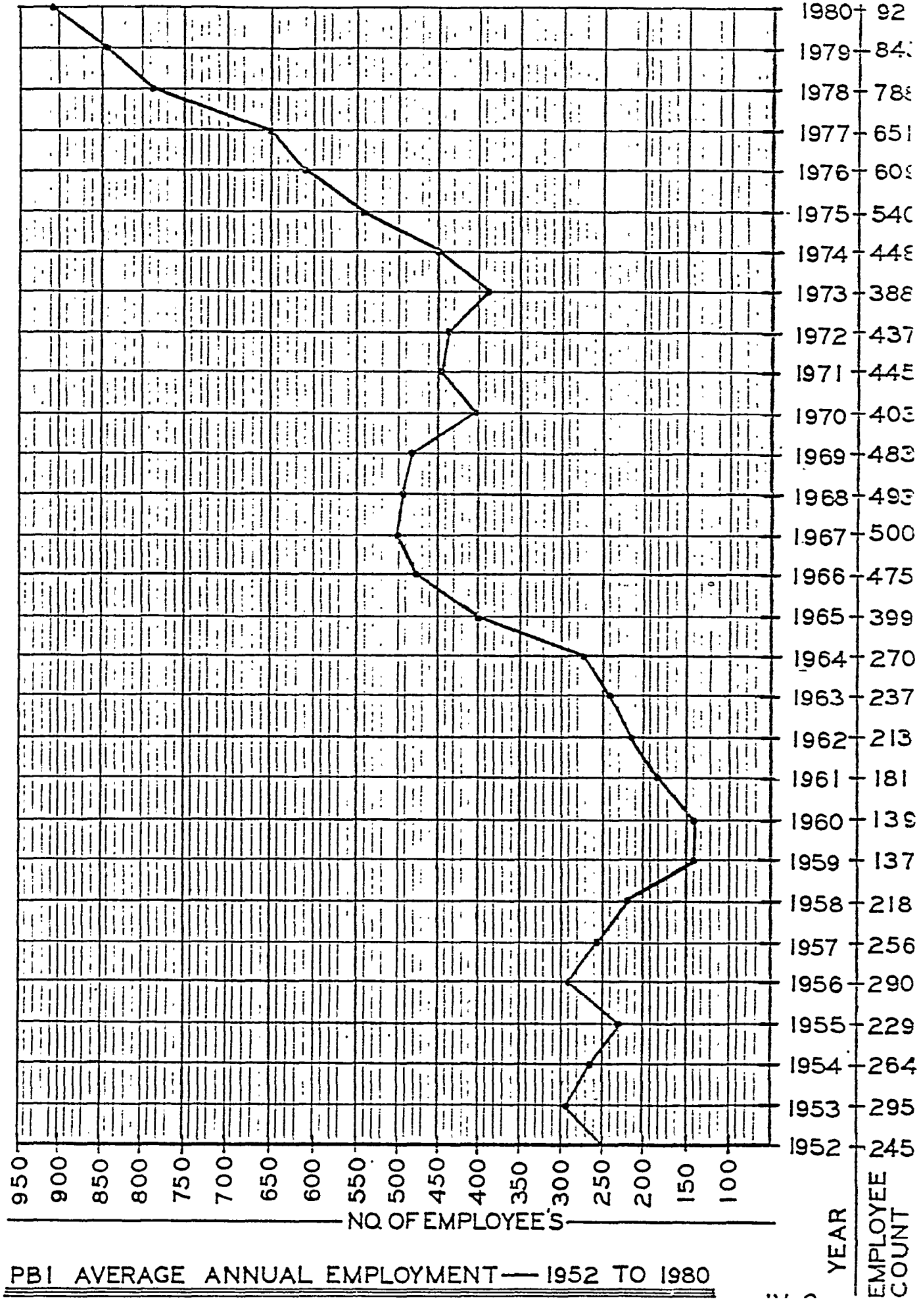
PETERSON BUILDERS - 1968

Figure IV-6



1. SHIP CONSTRUCTION NO. 1
2. SHIP CONSTRUCTION NO. 2
3. SHIP CONSTRUCTION NO. 3
4. SHIP CONSTRUCTION NO. 4
5. PIPE SHOP
6. SHIP CONSTRUCTION NO. 6
7. MACHINERY MAINTENANCE
7A. BUILDING MAINTENANCE
7B. INSULATING SHOP
8. WAREHOUSE 8
9. MACHINE SHOP
10. ELECTRIC MAINTENANCE
11. ELECTRIC MAINTENANCE
13. WELD SHOP
13A. PAINT DEPT.
14. LAMINATING DEPT.
15. SHEET METAL SHOP
15A. SHEET METAL ANNEX
15B. STORAGE BUILDING
15C. STORAGE BUILDING
16. DIPPING BOOTH
16A. STORAGE SHED
17. TEST CELL
20. PLATE SHOP
21. PLATE SHOP EXTENSION
22. COMPRESSOR ROOM
23. BOILER ROOM
24. FLAMMABLE & HAZARD WASTE
25. 60 TON GANTRY CRANE
27. INSULATION/Q.A.
28. BUILDING MAINTENANCE
29. STOCK ROOM-OFFICES
31. OUTFITTING SHOP
32. BUILDING BERTH OFF. & SHOP
33. ELECTRIC SHOP
33A. WAREHOUSE 33A
33B. WAREHOUSE 33B
34. PROD. CONTROL/MAT'L. CONT.
35. ENGINEERING BUILDING
36. WAREHOUSE
38. PIPE STORAGE
39. FLOATING DRYDOCK
40.A,B,&C STEEL PROCESSING
41. MARINE RAILWAY
43. PERSONNEL OFFICE
44. PAINT BOOTH
45. BLAST BOOTH
70. PIPE FAB SHOP
70A. WAREHOUSE
71. CARPENTER SHOP
72. CARPENTER SHOP

From modest beginnings in 1933, employment rose to more than 400 during World War II and then declined quicklv during the post war period to a low of shout 25 in 1949. The receipt of new contracts for Minesweepers in 1951 all- the Work force to again grew and stabilize between 200 and 300 until 1959 and 1960 when it again fell below 150. During the next four years employment grew rapidly and settled in the 400 to 500 range for the next ten years (1965 to 1974) . Since 1974 the work force increased annually until it reached its present level near the SBA ceiling of 1000. (See Fig. IV-8)



PBI AVERAGE ANNUAL EMPLOYMENT — 1952 TO 1980

17. SHORT, INTERMEDIATE AND LONG RANGE PLAN

A. Approach To The Plan

The plan undertaken in this study was directed toward a short range future (one to three years frcm initiation of the study) , Intermediate range (four through ten years) , and long range (ten to twenty years). other than the necessary geographic and on-site research into PBI's existing situation, most of the study effort was concentrated on those organizations, systems and facilities which were straining the shipbuilder's ability to meet its contractual commitments and marketing goals. During early discussions between the SCI and PBI management of the short. range problems and objectives it became apparent that some management, system and facilities changes would be beneficial while the complete long range plan was being develop- and these changes have been incorporated in the body of the short range plan described hereafter. Although in the long range, one limitation on PBI's potential for expansion is its position as a "Small Business" under SBA guidelines, none-the-less an effort is being made to retain flegibility in the long range plan to allow this builder to avoid stagnation in a potentially expanding marketplace. While the PBI decision to maintain its SBA designation for the foreseeable future and achieving growth through increased employee productivity may prove to be by far the wisest choice, it remains necessary to include in the long range plan a consideration of the options which may allow sizeable expansions in the labor force and also to be positioned to exploit any increase in SBA manpower ceilings. A measure of this potential is that more than 7,000 people were employed in the four Sturgeon Bay shipyards during World War II.

As outlined in Secticn I, during April and May 1980, an in-depth review was conducted covering: schedules for engineering, materials and ship construction; work order coverage and content; reliability of manload forecasting methods; confidence in the consistency and accuracy of production progress reporting; and determination as to whether optimum ship progress and condition- was being achieved at at major ship milestones. SCI's extensive experience in a wide variety Of military and commercial shipyards was enlisted to provide a baseline against which PBI Forecasting methods, schedules, work control systems, reports, and progress measurements could be analyzed to determine whether the minimum elements were available to control the shipbuilding programs already in progress. For example, some of the analyses conducted and results were

Scheduling

Reviewed schedules to determine whether they had been consistently developed and integrated between Engineering, Procurement and Production to reflect those dates which had to be met to insure orderly progress toward meeting contract delivery or whether, to the contrary, they had become merely a reflection of each departments forecast as to when they would complete their tasks. An exanple of a potential inconsistency would be a drawing schedule which listed the "promised" issue dates- from the design agent, without showing when the production department needed the drawing to avoid construction delay.

The investigation was directed toward determining whether the output of the design agent and all PBI departments was fully scheduled, that is schedules for, drawings and material. requisitions from Engineering, purchase orders in Procurement, work orders from Production Control, as well as the more typical trade and craft production work schedules. Finally the studies tried to determine whether schedules were comprehensive and included not only work identified on issued drawings but forecast work as well.

Work Control Systems

A study of the work order system was made first to determine whether the content of an individual issued work order was sufficient to control the scope, cost and schedule for each task and secondly to determine whether all direct charging work on the contract was being directed by a well scoped and issued work order.

Engineering Prerequisites

An investigation was conducted into the condition of Engineering documentation. Typically the technical content of a contract ship design is transmitted to the Planning, Production Control and Material Control organizations in the form of Drawings, Bills of Material and Procurermt Requisitions and Specifications. These document, together with schedules defining when they are required in production and systems for advising of changes to tile documents, represent the engineering prerequisites to the production work on the program. Usually the schedules should show not only when the documents are needed but should

also indicate when the document was issued and whether it has been approved for producticn use. For example, the schedule should clearly show whether a drawing is unconditionally released for production or whether there are reservations, stop work orders , or pending engineering and contract changes which have not beeen incorporated. Ideally the schedule should also predict when the document will be released unconditionally.

Reports

At the time of the initial investigation into production control reporting, Production management had available to it, two bread categories of reports. One group attempted to measure work order progress but was limited to issued work orders. The second major group of managerrent reports was based on a task level network which had been created early in the Tuna and (PGG) contracts. Reviews were made to determine whether the reports provided PBI management with an accurate measure of production and cost progress against a contract baseline.

Concurrent with the detailed investigations into the managment control systems in use, SCI commenced a series of studies directed toward defining and describing the history, physical plant, market, competition, organization, constraints on expansion, community relations, product capacity and capability, and production flow paths.

B. Review of PBI Situation - 1980

During the second quarter of 1980, at the time wlnen PBI commenced the preparation of this long range plan under the MarAd Consensus guidelines, PBI was well underway on a nine ship PGG and seven ship Tuna Seiner program. Although PBI had considerable skills and experience with both combat and commercial ships in this size range, it was becoming increasingly evident that the complexity of the ships and the extent of customer mandated changes, particularly on the PGG's, was far in excess of anything previously experienced or expected. This, together with the very rapid expansion of the workforce necessitated by these large shipbuilding programs, had placed a severe strain on both the PBI organization and the systems in use to Control ship construction. The specific task facing management was to complete one PGG and two Tuna Seiners in **1980 and tO** fOllow on with four PGG's and two Tuna Seiners in both **1981 and 1982.**

The review of the management systems in-place at PBI in the spring of 1980 revealed two situations whose resolution would form the basis for the short and intermediate range plan:

1. **Outline** and implement actions required to meet commitments on both the PGG and Tuna programs, and

2. **Further** develop **a** Company Wide System of management controls, reports, schedules and procedures adequate to handle complex ship construction and the expanded workforce.

Specifically the system review identified some difficulties in each of the management areas where action was required to insure meeting contractual commitments. These principal conclusions were:

a) The large infusion of Contract changes into the PGG program had delayed construction work and forced a temporary reduction in PGG manpower requirements which PBI had offset by proceeding speculatively in advance of contract on the Tuna boat program. The lack of a revised master schedule and manpower plan reflecting these decisions had precluded management visibility into the long range effect on contract deliveries.

b) The attempt to absorb contract changes into the ship design prgrams had resulted in the drawing schedules more often representing the designer's and Design Agent's best promise of drawing issue rather than a statement of Production's need date. Since all drawings required to implement a program were not forecast in the drawing list, some drawings urgently required by Production were neither scheduled nor under pressure to be issued.

c) Master work order schedules included only those orders which had actually been released to Production departments. Thus any manpower, budget, expenditure or schedule summaries produced from tie rester list provided insight into only a part of the production work. To the extent that work orders were

not released in a timely manner, these work order schedules could not be used to measure physical progress with any integrity.

d) Although material delivery schedules were not totally integrated with production schedules, this shortcoming was offset by PBI action taken early in the program to order multiple shipsets of material to dates in advance of the lead ship requirements.

e) A facility usage schedule was prepared but as schedule delays occurred it deteriorated into a "picture" of facility occupancy by major hull assemblies and sections. The variance between this "schedule" and work order schedules created some confusion for production supervisors.

f) Work orders were prepared primarily to authorize production cost changing on an initial issue of a drawing. Work orders were not rescoped or reissued to define work generated by drawing revisions or contrac changes. It was assumed that Production depaarments would work to the latest issued drawing and would respond to receipt of a new drawing revision even though work on the initial drawing had previously been completed. This did not always occur and presented. problems to test and inspection When ship completion neared.

g) A single work order could cover work in pre-fab, assembly, exection, outfit and test areas and collaterally through a broken series of schedule intervals. Thus the order provided insufficient control of schedule, routing or shop planning.

h) The responsibility for material takeoff and development of a comprhensive bill of material was dispersed between several departments with a potential for incomplete bills of material and material procurement.

i) Design changes created from customer changes and engineering development efforts were transmitted to production through a multiplicity of routes: Engineering change notices, liaison notices, memos, verbal instructions, sketches, drawing revisions, etc. With no work order action on these transmittals by Production Control, conflicting instructions were occasionally communicated.

The overall result of these conditions, together with the direct schedule impact of massive contract changes, was that PBI management did not have available to it a concise measure of program status, manpower needs, nor probable effect on scheduled deliveries.

The study also gave an insight into some of the broader problems facing PBI and allowed the identification of some additional strengths and weaknesses which would be incorporated into the longer range aspects of

the plan either in the form of areas requiring improvement plans oa as a basis for evolving stronger organizations for the future. Even though PBI was living with the problems created by rapid expansion, customer contract charges and the transition from relatively simple to highly complex and densely packed ships, the organization clearly had certain strengths which were and will be valuable in solving these difficulties Some of the more obvious strengths are its ability to produce high quality vessels in either steel, aluminum, wood or fiberglass due to its highly skilled work force, many Of whom are competent in than one trade or material. This work force is well educated and turnover in the area is relatively low for the industry. As a counter to the inclement winter wsather, PBI has a high percentage of its building facilities enclosed for weather protection. Facilities have been well maintained, the yard is clean and the company owns or leases extensive enclosed warehouses. Corporate financing is sound with no debt. In addition to the challenges facing PBI management identified in paragraph B above, several other problem areas surf aced which will be addressed in the plan. Some of these are; insufficient discipline in meeting schedules at all levels and loose control of the design agents both in terms of adherance to schedule and in the definition of expected drawing content, standards and quality. Managements lack of confidence in the production control reports had allowed serious undermnning to occur in several outfitting trades which would ultimately take exceptional effort to correct. Finally a long PBI history of always delivering ships on schedule had left its management unprepared to deal effectively with a government customer who Simultaneously directed many disruptive contract changes to

PBI while insisting that the original contract delivery dates must be aclhieved as a matter of overwhelming national interest.

2. Actions To Meet New Construction Program Commitments

To respond constructively to U.S. Navy demands to continue to meet contracted PGG ship delivery schedules and to satisfy its own commercial tuna boat programs without exceeding the SBA manpower ceiling, PBI management ascertained that a number of actions would be required:

Based on the actual status of each ships program in mid - 1980, the remaining work was replanned and a recovery schedule published defining work which had to be done to deliver the first PGG in 1980 and to bring all ships on schedule by the end of 1981. This so called “intensification” effort succeeded with the delivery of the fifth PGG on schedule in December 1981.

A number of internal reorganizations ware underteke directed toward strengthening the prociuction departments, consolidating the production support functions, and simplifying the engineering group. Most of the changes were accomplished by the fourth quarter of 1981 with some details to be finalized as part of the intermediate range plan.

To increase the opportunities for schedule acceleration in the PGG program, an attempt was made to Sharply increase assembly pre-outfit and module zone outfit. Partial improvemnet was realized on the

fourth ship of the class and bt the sixth ship nearly all outfit goals were achieved and subatrantially earlier ship systems outfit enabled PBI to accelerate schedules. Although additional cost effective zone outfit was identified, it would have required basic structural and N/C program redesign with unacceptable re-engineering delays. More specifically:

1. PGG Recovery Plan

Principal early activities were directed toward development of a pragmatic recovery schedule for every ship under construction through a total review of actual ship progress and an assessment of remaining work to be done. This resulted-in a set of bar charts which were issued to Production, maintained by planners and progressed by the Superintendents and Ship Managers.

Manpower assignment became more orderly and schedule discipline improved. Based on experience on the lead ship in each class, a complete work order forecast list was developed and scheduled. A detailed sequence study was made for each major PGG hull module and work orders were recast to call for zone outfit of each module prior to joining each module to the next hull section. A zone outfit supervisor was assigned and outfitting commenced approximately two months earlier starting with the fourth ship of the class. Overly large or lengthy work orders were split into more manageable packages. A formal change notification system was initated between Engineering and Production Control and change notices which

by-passed production control were eliminated. The new work order master schedule was summarized to provide an effective manload forecast for each trade and weekly work order progressing was instituted between Superintendents and Foremen with a periodic overview by the Production Manager and the Vice President of Operations. The results of this day-by-day recovery effort consolidated the recommendations and actions of the short range plan adopted by PBI.

2. Internal Reorganization

While the PGG "intensification" effort and recovery plan was being initiated, a detailed review of all the organizational areas at PBI was being conducted. A variety of organizational alternatives were constructed to enable PBI management to understand functional options which could simplify the chain of command and clarify department responsibilities. In some cases recommendations were made to divest certain functions from a manager since they were conflicting with the manager's ability to implement his primary function. Particular emphasis was placed on the responsibilities of Program Managers, Ship Managers, Planning and Prduction Control management and functions, Engineering management and the possible role of a Material Managar in the future plans of the company. By the spring of 1981, PBI had spent some month in managing the cliff difficult PGG "intensification" program and had acquired a new Production Services Manager who was able to continue with the development and implementation of tile recommended production control changes.

The short range plan includes the period between 1980 and 1982. Chart V-1 defines the PBI organization at the initiation of the MarAd Study. subsequently, many organization, systems and facilities changes were developed, accepted and have already been implemented. Chart V-2 shows the PBI organization as it has evolved as of December 1981. Implemented changes, several of major or impact, have resulted from detailed discussions between SCI and members of PBI manageement. There are some recommendations in the Short Range Plan which have been accepted but are not yet implemented. These are identified 1n the form Of re commendations for future actions.

Organizational recommendations for the short range program were limited to those which would quickly lead to a strengthened and more disciplined planning and production control function. In reality, the reorganization of the entire corlporation has almost been completed during the short range phase and therefore remaining short range and intermediate phase organizational recommendations have been combined (see Chart V-3).

Major changes which have already been made as well as recommendations fcr additional change are as follows:

a. Finance - The important changes in this department include the addition addtion of a Supervisor over the General Accounting function and the consolidation of word processing and micro-filming sections (from Engineering) into the Management Information systems Department. This supervisory position should add strength to the Accounting Group and reduces from 6 to 4 the number of people reporting directly to the Vice President-Finance. The change was implemented in October 1981.

b. Engineering - These departments have undergone a major revision as follows:

1. Until recently, there were two independent Engineering Departments at PBI. One served commercial customers and the other, much larger, basically served the military contracts. These two departments have now been combined with the President E. L. Peterson acting also as Vice President - Engineering. This important position remains to be filled.

2. Contract Administration, Program Management, and the IIS group previously were functions in the Engineering Department. This potential conflict of interest has been eliminated by creating an independent group including all

of the above functions under a Vice President - Program Management and reporting directly to the President.

Most of this change has been implemented. Commercing with the ARS and MCM programs, a Program Manager is being assigned to each program to act as PBI's representative to the customer and ot be responsible to the President for the successful implementation of contract requirements and Commitments by PBI. The principal functions of the Program Manager are:

a. Secure line manager's commitment of manpower and resources to accomplish their functions to meet contract schedules and budgets.
b. Communicate PBI requirements to the customer to ensure that customer information, material and funds support PBI needs.
c. Secure proqress reports from line managers and provide PBI managment with objective analyses of program status.
d. Coordinate the developent of program recovery efforts.
e. Coordinate the response, acceptance and implementation of customer changes and PBI engineering developmnets.

3. The group of professional enginneers each of whom formerly reported to either the Chief Engineer or the Vice President - Engineering has been placed under a Manager of Engineering Services along with the Technical Support function. This important new group, also includes the Test and Evaluation, PBI Design Agent Representatives, and the weight control functions. This new group, under a manager will reduce the number of people reporting directly to the Chief Engineer and will provide for improved utilization and service.

4. A representative of PBI has been selected to represent PBI at the Design Agents. This is a very positive effort to improve the Agent's drawing quality and adherence to schedules. Both of these have been problem in the past. This should become standard procedure with each new contract involving a design agent.

5. A senior member of the Engineering Department has been assigned as Engineering Planner and made responsible for establishing and maintaining engineering schedules and priorities.

c. Contract Administration - As mentioned previously, this function and associated services were formerly an integral part of the Engineering Department under the V-ice President of Engineering. In this position, the Vice President was totaly responsible for two major but competing functions, Engineering and Program Management. In practice, the Vice

President was required *to* report objectively to management On his own Engineering performance. In the new organization, as Vice President of Program Management and completely independent of the Engineering Department, this Vice President is responsible for all aspects of Customer relations, program management, contract administration and IIS.

In this regard, PBI should now be engaged in a full time marketing effort with special emphasis on commercial vessels. Also, since the President provides the principal marketing effoft to the Navy, the time is rapidly approaching when he should start to train a replacement in this activity which is so vital to the company.

d) Vice President and General Manager

In addition to acting for the President in his absence, the duties and responsiblities assigned to the General Manager have been changed considerably:

1) He is no longer directly responsible for the Commercial Works Department whose functions have been incorporated into the Engineering Department and Program Management.

2) Operations, under a new Vice President now reports directly to the President.

3) The purchastig function and all personnel will now report to a Materials Manager.

4) A new Production Services department, has been created. This department, headed by a manager, reports to the General Manager, includes the following functions:

a) Master Planning
b) Detail Planning
c) Production Control Services
d) Materials Management (which includes purchasing, Material Control, Allowance Secticn, Warelhoustig and Transportation) .

This department when fully implemented will control all materials from the purchasing function through to delivery to Production. To head the Production Control Services Department as Mnager, an experiernced person was successfully recruited from outside PBI to head the reorganized department.

5) Further, the Industrial Engineering function under a manager will report directly to the Manager - Production Services. This places the major service functions of Planning, Materials and Industrial Engineering within one organizational group where they will be most efficient and effective. This change has not yet been approved and remains to be implemented.

6) Fire and safety will be placed under Employee Semites.

Production . The former organization had a Production Department headed by a Manager - Plant Operations reporting to the Vice president and General Manager. The Production Manager now reports directly to the Vice President Operations. Additional changes in the department are as follows:

1) The specific duties of the Hull Superintendent have been completely revised to include all hull work including steel, aluminum, and wood construction and all welding. Formerly this Hull Superintendent was responsible for paint, steel hull, joiners, carpenters, and berth erection.

2) A Superintendent Outfitting has been placed in charge of electrrical, insulation and fiberglass and eventually will absorb pipefitters, machinists and sheetmetal.

3) A Superintendent of Blast and Paint will be established.

4) A Proudction Manager has been placed in charge of the superintendenrts.

5) The Planning function has been placed under the Manager - Production Services.

6) A testing function has been established under the direction of a manager.

7) The Ship Managers have been remved from the Production Control Department and placed directly under the Production Manager.

g. Age Of Organization - PBI does not require that a person retire at the age of 65. However, for this evaluation, the age of 65 has been used as a likely date for retirement. A review of the key persornnel shown on Chart V-2 indicates that a sizable number of these people are young and theoretically have many yeers of service remaoning. This chart also indicates the individuals who may retire in a relatively few years. Within a 10 year period the President and every Vice President will attain the age of 65. Several other key members of management will also reach retirement age within the same period In order to prepare for this potential turnover of executive talent, steps must he taken in the very near future to identify future candidates for these positions and PBI should develop a planned program of advancement so that, when the time cores, trained replacements will be available. This includes the position of President and in particular preservation of his excellent knowledge of and abilities in the area of military marketing.

h) The number of people reporting directly to the Facilities Manager was reduced from 12 to 3 representing Maintenance, Material Handling, and Temporary Services. The reorganized departmnet is almost identical to an earlier plan developed by the Facilities Manager but not implemented.

3. Implement Module Zone Outfitting

AS with many well established shipyards, the practice of installing mechanical, piping and electrical equipment in hull sections and modules prior to erection on the building ways has been accomplished with many variations in the past. Current literature tends to call this effort "zone outfitting". Relatively late outfit design information on the new PGG class and the second group of Tuna Seiners currently under construction delayed the entry of the outfit crafts suficiently so that little pre-outfit or zone outfit was underway in these programs. Schedule compression in the outfitting of the early ships in these program resulted in manhour overruns in key outfit crafts with a secondary impact requiring additional outfit craftsmen in trades already in short supply. During the third quqrter Of 1980, to avoid a continuation of this expensive practice, it was recommended that production management transfer non-critical piping and electrical work to the structural trades and dedicat the manpower relieved by this action to zone outfitting the next completed hull modules on the PGG program. Detailed plans for piping and electrical work were developed by a small team including

planners, key trade foremen, using SCI'S experience in zone outfit of complex combat vessels. Where necessary, work orders were split to reflect only that fabrication and installation required for each module. As a guide to the installing foremen, detailed bar charts were developed to insure a common understanding of the sequence of related work including foundations, insulation and painting. Relatively dramatic manpower savings were reported for the zone outfit work that has been accomplished but the program has not yet reached optimum implementation due to the impact of major customer contract changes on the work package for these same key trades. The techniques and benefits of zone outfitting are well recognized but maximum benefits are still dependent on the early availability of outfit craftsmen and the completion of systems engineering at a much earlier date date that required for more conventional post erection outfit.

D. Initiation of A Company Wide Svstem

AS the specific actions aimed at meeting ship construction program commitments began to take effect, attention was directed toward initiation of a "company wide system" which would improve the integration of engineering, materials, and production control. Singled out for management action was the need to:

- Install a comprehensive PPC system.
- Develop a precise control for communicationg changes and developments control to the production trades.

- Create an engineering date base accessible to producremeet and planting based on a comprehensive engineered ship's bill of material.
- Improve the accountability of material from identification on a drawing through to shipboard usage and surplus disposal.

Progress in these areas required not only changes in administrative procedures but inplementation of the organizational reforms described in section V. C. 2.

During 1980 and 1981 Considerable progress was made in the establishment of a PPC system with positive communication of engineering changes and resolution of changes requested by production controlled via the Production Control department. Although considerable groundwork was accomplished toward establishing the engineering and materials deta base, the realities of computer memory size requirements and the installation of new IBM System 38 capacity late in 1981, militated for the full application of these capabilities on the next new ship design and construction programs. This will be discussed further in section V.E in relation to actions being undertaken to implement the ARS and MCM programs recently awarded to PBI.

Progress to date on the PPC system end on Engineernig Change Notices (ECN) and Production Change Request (PCR) systems is

1. Install a Comprehensive Planning and Production Control (PPC) System

a. Early efforts to document the PBI PPC systems as a point of departure for fuether intermediate and long range company wide systems development, uncovered several shortcomings which required early correction. The principal items which have been identified are:

1) A work orderting system which, in general, authorized cost charging to major cost account groups but did not precisely define the scope of work included within the boundaries of the work order.

2) Work orders with an excessively long span time which in turn compromised use of the work order system for either schedule or progress control.

3) Contract changes and engineering developments implemented at the work site only through the release of a drawing change but with no specific revision to work order scope or work order schedule.

4) Incomplete work order coverage of all productive work required on a contract.

5) Issue of an excessive number of “time phased” work orders with no stated scope of the work to be accomlished during the prescribed time period.

6) Future work package content was not forecast. Thefore a work baseline was not created against which to neasure physical progress, budget or schedule performance.

7) The work order schedule was inconsistent with the master construction schedule for the ships under contact. The shipyard manload forecast was not summarized from the content of the work order package.

8) 8) Work order completion and ship test schedules were not integrated.

9) Work orders did not direct work to be accomplished at a specific work station.

In In spite of these difficulties it should be noted that previous ship contracts were delivered profitably and on time.

b. Signifcant progress has been made to develop a PPC system which can resolve items identified in paragraph a. above and can form the basis for definition and control of work package schedule and scope and can accurately forecast and measure

manload requirements and physical progress. The major chenges which have been implemented are as follows:

1) The development of a comprehensive work order master catalog, schedule and budget for all productive work required on each ship under construction. For follow-on ships of each class a suitable learning curve adjustment has has been made in the work order budget. Where excessively long work order schedules or large budgets were encountered, the work~ orders have bene split into more manageable units.

2) The completed work order rester catalogs have been loaded into the PBI's computer data base and reporting formats have been developed and tested which describe the work packages which must be accomplished in each schedule interval either by contract, by ship, by department or by supervisor together with manload requirements in these same categories.

3) More precise work order scopes were developed for new work and in particular detailed work scopes are being issued to define modular zone outfit. All test memos are covered by individual work orders and the test schedules have been integrated with the prerequisite work order schedules.

4) All drawing changes and engineering change notices are being covered by the issue of a work order or revision thereto so that the production trades are directed to work to a specific drawing revision with appropriate instruction on necessayr ripout and material disposition.

5) Many of the time phased work orders, particularly those associated with painting, have been replaced with definitively scoped work orders.

6) Recovery schedules were developed for all ships under the PGG contract and these schedules produced a realistic program for meeting contract deliveries.

7) The work order mnKster catalog and data base has included a provision to add a work station, module or ship compartment assignment number to each order to allow analysis of work station loading. A work station map and compartment numbering system must yet be developed to allow precise work order and material routing.

8) A data processing program is being used to summarize planned production manload for either fourteen weeks or months into the future by supervisor, department, hull c contract.

9) Data processing tabulations of unfinished work orders which are scheduled for start or complete through a current schedule date are issued to Foremen and Superintendents for work orders and departments under their control. These reports are used to progress work, man jobs in priority sequence, and keep the next hither level of Production management informed of any delays, manning shortages, hold-ups due to lack of information and performance deficiencies. In addition to departmental and contract reviews, these reports are regularly being used by the Production Manager and the Vice President of Operations to gain an insight into trade and contract performance.

c. In many of the anticipated U.S. Goverment new ship construction procurements is the requirement to comply with DOD 7000.2 Cost Schedule Control System which places considerable emphasis on visibility, control and performance measurement of all these functions which contribute to eitlher the cost or progress in meeting contract objectives. Although none of the contracts presently in force at PBI require compliance with DOD 7000.2, since much of its content is included in Contract Data Requirement Lists (CDRL's) it has seemed prudent in the short range plan to insure that all system changes are developed to be consistent with easy compliance with future government contracts . Toward this end, the elements of the revised PPC

system which have beenimplemented and the reports which can be prepared from the data base will allow production functions to be managed within the DOD 7000.2 guidelines. Prior to the Commencement of construction on a new contract requiring compliance some work needs to be done in production plaaninning to create work orders with even more precise scopes than those now in use, to shorten work order span times even further, to correlate material to work packages and to replace time phased work orders with orders having finite boundaries and schedules. In most areas the production planners have already introduced work orders which are adequate for schedule and cost control under 7000.2′.

d. Additional refinements remain to be made to the systa which was quickly installed in the latter half of 1980 and early 1981 to secure improved cost and schedule control of PGG and Tuna programs already underway. The recent hiring of a well qualified Production Control Manager has greatly assisted in completing the short range actions required.

2. Revise the Engineering and Contract Change Control System

At the commncement of this study, PBI had in operation an engineering change notification System which transmitted contract and engineering change information directly to the production trades either through a revision of a drawing or through a variety of change memos, liaison and/or change notice forms. In some cases

these notices by-passed Production Control leaving gaps in mat=xial. procurement, work authorization and subsquent cost accounting. In some cases, where the drawing revision was not distributed to all cognizant trades, the change was delayed in accomplishment. With this system it was difficult for any agency at PBI to certify that contract changes and engineering developments had in fact been accomplished as specified.

The shipbuilder also had in operation an infrequently used system which allowed production trades to notify Engtineering of apparent drawing or material errors and to suggest improved methods which could be incorporated into the design. As with Engineering initiated changes, these Production Change Requests (PCR's) were not consistently passed through tile work authorization group in Production Control and no positive follow-up was made to insure resolution of the recommendation and incorporation in a drawing revision. This practice resulted in cases of work being accoplished at colds with issued drawings, manhours being expended without authority and costs being accumulated in erroneous accounts. Where drawings were not revised to reflect a desirable improvement it became apparent that mistakes were repeated on follow-on ships.

In December 1980 a revised Engineering Change Notice (ECN) and Production Change Request (PCR) procedure was developed and issued for general implementation. This procedure required that all engineering changes and production requests be transmitted via the

Production Control department and that all work required by the resolution of these changes be authorized in specific work orders. The Production Control group was charged with insuring rapid resolution of all requested changes and follow-up on issued work. COncurrently production mangement has randated that trades accomplish no engineering requests without work order authority.

Short Range Facilities Actions To Support The PGG and Tuna Seiner Programs

Preliminary investigations of the PBI facilities were directed toward the cataloging of the existing plant and equipment and a definition of the flow patterns for manufacturing, assembly and erection of previous product lines and the PGG and Tuna ships currently being constructed. Peripheral studies were made of the major constraints on future development inherent in PBI's location at Sturgeon Bay, Wisconsin. Data was collected and analyzed concerning the limitations imposed on PBI by geographic and climatological conditions, labor pool, government statutory and code restrictions, community development plans for the area, utility constraints and existing yard arrangement. These studies are described in detail in Section VI. In recognition of the owners desire to maintain a manpower ceiling consistent with SBA guidelines and the conclusion that existing yard capacity was adequate for the PGG/Tuna programs, facilities planning therefore has been focused on productivity improvement rather than major facilities expansion. While the elements of the longer range facilities were being considered, preliminary discussions with PBI management indicated that some short range plans

could be implemented with immediate benefit to the ships under construction. Some of the most pressing facilities items were identified and implemented (see Fig. V-4) :

1. Acquisition of an indoor capability to abrasive blast and paint major hull section (block assemblies) in compliance with the U.S. Environmental Protection Agency (EPA) and State of Wisconsin Department of Natural Resources (DNR) air pollution guidelties.

2. Abandonment of the multiplicity of obsolete owned and leased warehouses and acquisition of more centralized warehousing facilities. An additional 28,800 sq ft modern warehouse was leased and six storage areas are being released for other use or sale.

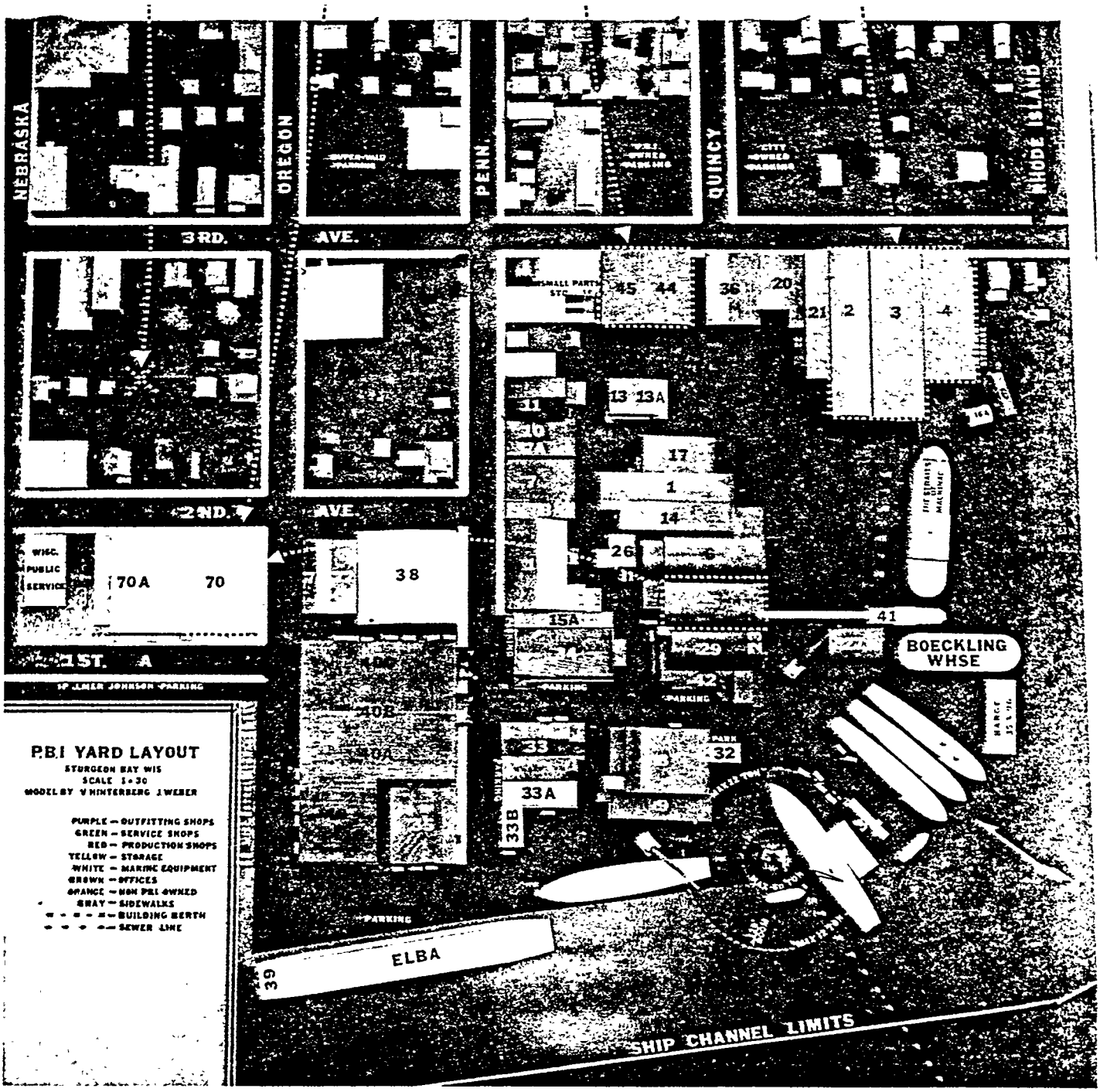
3. Relocation of the pipe fabrication shop from prime waterfront shop space to an adequate nearby site. Partial relocation has occurred from Building 5 to Building 70, but the move must be completed to achieve the benefits gained from shop consolidation. Building 5 should be used exclusively for the modification and adjustment of pipe spools and cut-to-fit work aboard ship. All other pipe shop work should be performed in Building 70. All pipefitter personnel except those working aboard ships should be re-assigned back to Building 70.

RELOCATION PIPE FABRICATION
FROM BLDG. 5 TO BLDG. 70

REPLANNED
MODULE ASSEMBLY
EFFORT — BLDG.
2,3 & 4

ZONING CHANGE TO
INDUSTRIAL

ABRASIVE BLAST
& PAINT FACILITY



PBI FACILITY IMPROVEMENTS
FPR PGG and TUNA PROGRAM
1980-81

Figure V--4

5. Replanned the use of indoor module assembly spaces to insure that dates for ship pullout from the buildings could be met and to increase the time available for zone outfitting of the modules. Relocation and extension of some of the module assembly jigs were considered to assist in this effort.

6. Secured changes in the zoning designations of some properties adjacent to the shipyard so that zoning limitations would not inhibit future PBI property development plans.

7. A curved panel line “pin jig” was designed and has been successfully utilized in the fabrication of larger steel subassemblies which promotedd quicker ship erection.

F. Snort Page Plan To Implement ARS And MCM Ship Programs

In September 1981 PBI was awarded a U.S. Navy contract to design and construct the APS-50 Salvage Ship with options for four additional ships in succeeding fiscal years (two in 1982, and one each in 1983 and 1984) . The APS-51 and 52 option award has been received. In addition they were awarded a design contract for the lead ship of the MCM Ship class with construction award expected in the second quarter of 1982. Navy program forecasts construction of fourteen MCM ships during the next eight years. An additional Navy program Contemplates construction of as many as nineteen YP Patrol Craft during the period from 1983 through 1987. Both the the MCM' S and the YP’s are of wood construction while file the APS is

essentially of steel construction. For the purposes Of manpower and facilities planning PBI has assumed a contract award baseline including five (5) APS, seven (7) MCM and ten (10) YP ships in their planned construction program. The implication of this plan is that during the next several years PBI will again experience a turn away from the Navy aluminum and commercial steel ships to programs including significantly larger Navy steel ships and an ongoing large wooden ship construction effort. With its workforce skilled in multiple material construction techniques, this produces no particular hardship for manpower skill planning but a number of facilities impacts have to be resolved.

A recent facility usage analysis has demonstrated that current and prcjected new construction ships can be produced to schedule without major new capital facilities construction, with one significant exception; the acquisition or construction of a new weed lamination facility for the MCM program. Some removal and relocation of functions in several buildings may be required to allow transfer of half-ship ARS hull blocks from assembly buildings to erection Berth No. 11. This sams analysis also cofirmed than less that optimum hull modularization would result and at least two ARS ships would undergo extended periods of relatively inefficient outdoor assembly and erection.

Further studies were pursued in December 198l to determine whether optimized construction with expected cost reductions could justify an investment in new capital facilities construction. Toward this end the PBI Facilities Manager secured preliminary designs for a new ship

assembly building containing three high bays to replace the existing ship construction buildings nos. 2, 3 and 4 and an alternate design for a new single bay building in place of part of Building 2 and all of Buildings 20, 21 and 22. Together with the new construction building, waterfront modifications may be undertaken to allow egress for the ARS hull blinks (See PBI Yard Plan - appendix EXhibit A.) Cost/benefit analysis on the proposed changes have shown that production cost reductions will provide satisfactory returns-on-investment (ROI) , of less than three years. These results can be expected due to productivity and access improvement, module and material handling ease, weather protection, and shortened scheules applicable to the ARS And MCM programs.

1. We have concluded that the above desirable results can be achieved by the following minimum facility modifications (see Fig. V-5) :

   a. Erect a new 230’ X 89’ high bay assembly building over building nos. 20, 21, 22, and part of building 2. Install overhead bridge cranes with a hook height of about 61’ and a combined lifting capacity of 100 tons.

   b. Convert Part of West side Plant No. 2 into the new wood laminating facility required by the MCM program, or construct a new facility off site.

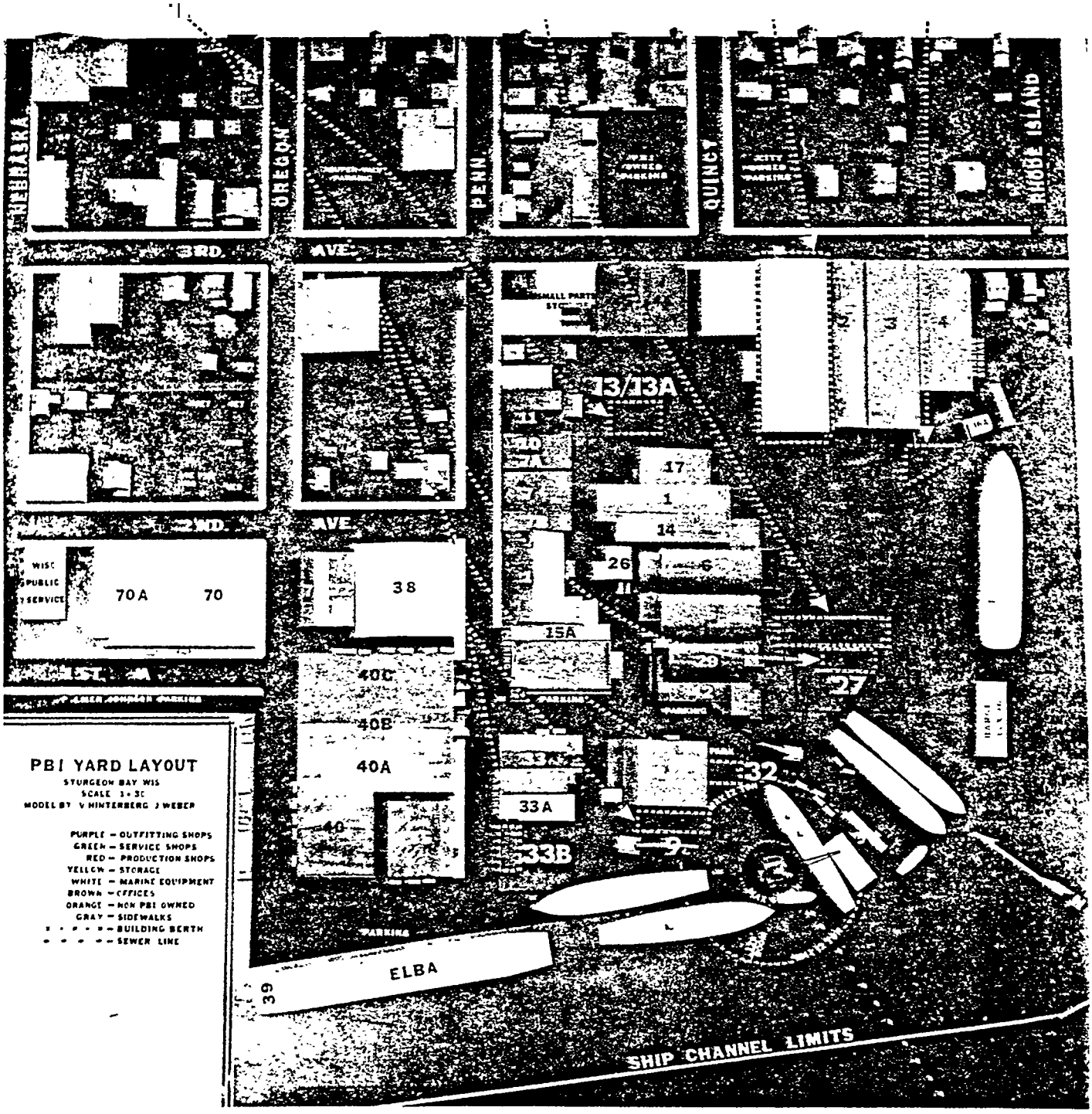
   c. Concurrently, a decision will be made so that hull modules of up to 100’ can be removed from Ship Construction building no.

POSSIBLE
REMOVAL OF BLDGS.
9, 13/13A, 27,32,
33B FOR ACCESS

REMOVE MARINE
RAiLWAY, EXTEND
BULKHEAD & FILL;

HIGH BAY SHIP
CONSTRUCTION
BUILDING 21

ACCESS
APRON TO
BLDG. 4



PROPOSED FACILITY IMPROVEMENTS
FOR ARS and MCM PROGRAMS

Figure V-5

4. There are several distinct possibilities:

1) Handle modules from Building 4 only with cranes.

2) Construct a short bulkhead and new langfill bahind the bulkhead to permit the movement of these large modules out of the building. Alternatively construct a structural apron from Building 4 to the bulkhead at Berth 2. This will involve an area sufficient for module removal and fork truck access to the staging material storage area and Building 16. Remove the marine railway rails, finger pier no. 3 and extend the bulkhead about 70 feet to the Triangle Dock. Dredge outboard of Berth 2 to allow ARS launches.

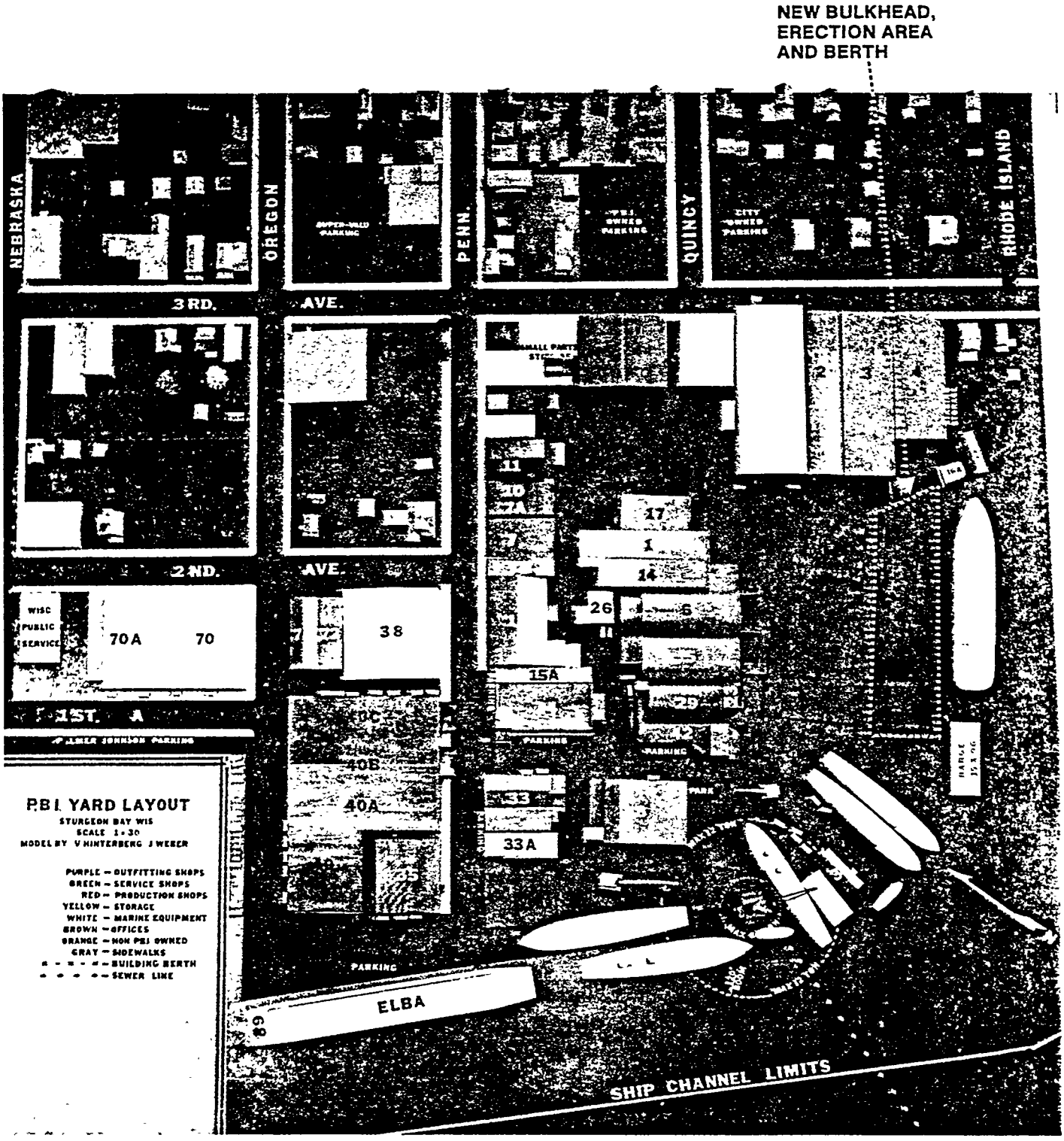
d. In addition, PBI is studying the expansion of the usage of existing Plant 2 to accomplish manufacture of engineered components and assemblies (such as deck machinery) .

2. To allow easy transfer of ARS hull sections from the module assembly buildings to the blast and paint facility and the half-hull block assemblies from the high bay building to the launching berth, several small buildings may be razed or relocated and their functions housecd elsewhere. PBI may raze buildtings 9, 13, 13A, 16A, 32, 33B and relocate portable shed 24 out of the yard. If Berth 11 is used for ARS launching, the machine shop would be consolidated in Bldg 8, with heavy machinery assembly conducted in a re-arranged

Bldg 17. Welding Dept in Bldg. 13 could move to Bldg 5 and the Paint storage will be located in the new high bay mezzanine. Furthermore, PBI will improve the utilization of their building W-6 on the west side of Sturgeon Bay, by consolidating the fabrication and assembly of either alumninum or steel small structures (depending on the major ship program preference) in this building. A new floor arrangement remains to be prepared together with plans for equipment relocation from Bldg. 40A.

3. A somwhat more amibitious and expensive option is under consideration to be accomplished conucrrently with the high bay building construction. Although it does not directly improve the productivity of ship hull erection and outfit, it does improve the flexibility of usage of Buildings 2, 3 and 4, and provides both an added outdoor ship erection position and increased pier space. The concept envisions creating a new bulkhead from the southeast corner of Building No. 4 to the outboard face of the Triangle Dock. (see Fig. V-6) Construct a new building berth on the bay side of the new bulkhead and dredge sufficiently for the safe launch of a vessel as large and wide as the ARS.

Such a building and launching facility will enable PBI to erect an essentially complete ship under the cover of any one of the three new bays, move it to one of the two building berths (adjscent to berht 2) and lauch. Because of the additional major work which will be completed in one of the bays, the time required for outside



PBI — DESIRABLE ALTERNATIVE TO ARS and MCM IMPROVEMENTS

Figure V-6

ship erection prior to launch will be reduced to an absoulte minimum. (No more than 5 to 6 weeks.) With this arrangement all ships erected in the high bay building can be launched at Berth 2, with Berth 11 reserved for short temr overloads, launching unique very large one-of-kind s-nips, etc.

The ARS Class of ships are longer than can be comfortably accomodated at most of PBI's present outfit berths. Also the ARS require an extensive fitting-out period. An analysis of ship design trends indicates that ship types in general are getting longer. This new bulkhead provides excellent pier length for outfitting at least one ARS and a second can be accomodated along Berth 11. It is possible that space will be required for docking a third ARS. In this event, the floating drydock ELBA could possibly be relocated across the bay for temporary docking. In this event, the City Dock, where the ELBA is now moored might be used for the outfitting of a third ARS.

4. Although less likely of realization, PBI needs to remain alert to opportunities to acquire property now held by its westerly neighbor, Palmer-Johnson shipyard. The geographical relation of this property to the main PBI yard offers a potentially less expensive solution to the MCM Laminating Facility, medium sized wood ship construction, and the long range need for large snip outfit piers. Such an acquisition could also accelerate PBI negotiations to transfer the intervening City Pier to PBI ownerership. If outright acquisition of

Paler-Johnson is not feasible then PBI can explore the possibilities for an equitable trade for the PBI Backey/Bikeau tract on the West Side of Sturgeon Bay. In this eventuality, PBI could consider moving the existing buildings nos. 2, 3 end 4 to the Backey property for Palmer-Johnson use. This would require extending the new high bay area to include Buildings 2, 3 and 4. If this option is to directly benfit the first MCM and the early ARS ships, then negotiations need to be concluded early in the first quarter of 1982. Other than the obvious benefits of contigious geographical location, the acquisition of the P-J property could provide PBI with buildings directly useble for the MCM lamimating facility, YP erection, and 600 feet of waterfront.

5. Finally, preliminary studies have been prepared to assess the feaisibility of installing a panel butt welder and stiffening machine in the structural fabricating building (probably bay 40A) to produce the large number of flat deck, shell, bulkhead and bottom panels required for the ARS program. These studies demonstrate that a favorable ROI can be achieved if several ARS ships are awarded to PBI .

G. Identification of Inteemediate Range Actions in Support of Planned Construction Programs

In addition to the specific facilities changes being undertaken to implement the ARS and MCM programs, as described heretofor in section V. F, positive actions are underway to strengthen the support activities

and prepare PBI for a period in which essentially all company operations will be directed toward U.S. government shipbuilding contracts. These efforts are being initiated as part of the "Company Wide System" during the short range period and should be fully operational during the intermediate range period. The principal activities are:

1. Planning and Production Control Developments

As a continuation of the PPC system improvement initiated for the PGG's and Tuna Seiners, some additional consistent features are being implemented as an integral part of each new major shipbuilding program When a major program is undertaken these planning changes are incorporatedd in the early stages of engineering development to insure total contract management to meet both technical and product commitments under the contract. Since new major programs will be for the U.S. Government, these developments will be directed toward DOD 7000.2 compliance. Some Of the planning systems which are partially ih-place at present but which require further development are:

a. PBI has in-house capability and personnel to accoplish network planning and a growing capacity to apply data processing analysis to the elements of time, manpower and cost. For the ARS and MCM program it is intended that network planning will provide the basis for scheduling and manning all Production activities and will include engineering and procurement. Existing PBI data processing personnel are well qualified to

implement these changes and new hardware with adequate capacity has been acquired and additional hardware acquisition has commenced. Several planners have been trained and have participated in the application of network planning to construction phases of the shipbuilding effort and additional training is proceeding to qualify more planners and to expand their abilities to include contract administration, engineering and material planning within the network and control programs.

b. Conduct zone outfit, module outfit, and sub-assembly planning as an integral part of the ship design and productivity planning on the new contracts. A significant feature of this investigation is the definition and preparation of discrete drawings which depict only that work required for a particular module or assembly package.

c. Create the work order and cost control data base which will be consistent with the network plan and the guidelines of the simpler Department of Defense cost and schedule control system (DOD 7000.10) which is required on the ARS program.

d. With the formation of an integrated material data base identified to each drawing and emplaced in the computer, Planning will be able to identify each material line item to an end use work order. With this capability, and with Materials department reporting material deliveries to the computer it

will become possible the Material Control section to determine and report that all material required for a particular work order is available. Some physical material staging will be used.

e. Where material is made excess by an engineering change, the work order will direct the disposition of this material in accordance with Engineering department instructions. The Material Control group will take action on these work orders to retrieve, account for and dispose of the material.

Capture narrative work scopes in the data base for the repetitive jobs encounter on typical PBI ships as a basis for computer generated work orders. The companion to this document may also be computer generated work order bills of material since the basic data is being incorporated in the material data base by Engineering. Relatively simple computer input can direct material line items and quantity to be assigned to work order number with subsequent preparation of the work order and bill of material. Through this device production planning personnel will be relieved of much of their present clerical and engineering checking work load and can concentrate on the more fruitful planing aspects of job sequencing, manning, pre-outfit, resource management and sales trade-offs, etc.

2. Engineering System Modifications

With the reconsolidation of the engineering departments PBI will clarify the responsibilities between the Engineering department and the newly formed Materials department to be set up under Prduction Services. Material ordering and control systems currently in use did not include precise schedules for ordering the three major types of material; special engineered components, unique plan and mark material, and bulk order inventoried material. Further, responsibility had been split between Engineering and Production Control to identify, requisition and order material in time to meet ship construction requirements.

a. Materiabls department will be responsible for ordering and expenditing the delivery Of all production naterial to schedule, warehousing and accountability of all material from receipt until deliveyr to a production trade, and custody and disposal of surplus materials. Further they will establish standard lead times for all material categories to be used by Planning in the development of material ordering schedules.

b. Engineering department will identify on drawing bills of material all material required for the construction of each ship and will requisition all materials included on the bills of material to meet Planning schedules. Further Engineering will establish an internal material accountability section to

cnntinously advise Production Cortrol and Material Control of changes in contract material requirements.

c. Planning will issue schedules for the ordering and delivery of all material for each ship. These will include detailed schedules for engineered equipment and major components, customer furnished equipment, categories of material for typical drawings, bulk releases of stock material. Based on delivery predictions and actual receipt information from Materials department, Planning will report material status to management and analyze the impact of delays on the production effort.

Sores further system changes appear desirable during the intermediate range. These include the aforementioned changes in drawing practice to provide drawings which are unique to ship modules particularly for outfit piping, mechanical, HVAC and electrical systems. With the planned establishment of a material data base on the newly acquired computer hardware, PBI will initiate a standard stock numbering system and discipline its use.

3. Material System lmprovements

The establishment of a materials group including Procurement, Material Control, Warehousing and Transportation, under a single manager will allow the implementation of a nuumber of material system changes which should sharply increase management confidence both in

the availability of material to the production trades and in the accountability not only of installation materials but in the disposition of customer furnished and surplus material. Although the existig PBI material systems require that material needed by a Production trade be formally requisitioned from one of their several warehouses, none-the-less the existing PBI system is essentially an "open warehouse" system, in that extra and replacement material is not accounted for in a strict allocation and reorder control system. Also, material made excess by engineering changes is not totally accounted for and returned to a control point for disposition. Finally confrmation is not made that all material required for a work order is available prior to issue of that order to the trade. The burden is placed on the trade to requisition the material and announce shortages to Material Control. However, in a more general way the Material Control group does attempt to insure that purchased material has been delivered and that inventory stocks are adequate. To correct these shortcomings PBI is effecting the following changes to its material systems and organization:

a. Has assigned the Procurement department to the Materials Manager.

b. Assigned all storehouses and shop stores to the Materials Manager and transfered all storekeepers to the Materials department.

c. Assigned all over-the-road truck and in-yard transport required for the transfer of raw material from vendors to the production trades to a Transportation group within the Material department. Production cranes and ship section moving dollies will remain with the Production department rigging group.

d. Transfered the Material Control section from Production Control to the Material Manager and assigned the Materials Manager to the Production Services group.

e. Developing methods to confirm material availability for each work order prior to scheduled start work date and report this availability to the computer work order master file.

f. In general PBI will issue material to the trades only as required by work order quantities. Any additional material necessary to replace damaged material or to satisfy underestimates on tile engineering bill of material will be accounted for by the Material Control group so that reordering and bill of material correction can be undertaken. This approach will lead to a “closed storehouse” system.

g. As directed by work orders, Materials department will recover all material made excess by the order, and retain custody of surplus material and insure proper accountaility and

disposition either through sale, delivery to the customer, scrap, or return to inventory.

h. The Procurement department will develop lead times for all material categories used by PBI. These lead times will be applied to material delivery schedules prepared by Planning. The lead times will be used to define required dates for Engineering to provide purchase requisitions to Purchasing and dates for the buyers to place purchase orders. The Materials group will expedite Engineering for requisitions and will report the status of material ordering and delivery to Planning and Production management on a regular basis.

4. Computer Aided Design and Manufacturing

The new construction drawings for recent large Ship programs at PBI usually have been prepared by a contracted design agent while a significant amount of drawing maintenance has been accomplished by an in-house engineering and design department. To reduce the long term costs of drawing maintenance PBI has embarked on a program which will secure an in-house computer aided design hardware and software capability. In 1982 an IBM 4341 computer will be installed utilizing the Lockheed developed CADAM software and a Versatec plotter. With the dependence on design agents likely to continue, PBI is exploring the development of bridge programs to allow PBI to access any data base in use at its design agents. Since the selected CADAM software does not presently include a hull lines fairing capability, PBI expects to continue to use one of the

licensed systems such as SPADES or ATOKON, SRS, etc. As computer aided design systems become more prevalent in U.S. Shipyards, PBI anticipates that it may be able to participate in a coalition of shipbuilders and software designers to incorporate a lines fairing capability in systems such as CADAM.

5. PBI/MIIWD/SNAME Ship Production Activities

For the last two years PBI has been cooperating with NARAD and the Ship Production Committee (SNAME Panel SP-8) in efforts to develop Labor Standard Data. During 1980 the program generated a Work Management Manual for pipe spool fabrication. In 1981 the industrial engineering standard elements were summarized at a higher level to provide an application method for planners use and several pilot program applications have been implemented. These pilot programs are continuing and are being used to determine whether reliable and repeatable results can be achieved in a shop environment.

In 1981 a similar program was initiated for electrical and electronics manufacturing. Although early studies suggest that the separation between electrical manufacturing and installation at PBI is less defined than in piping, progress has been made toward creating electrical labor standards with the program shout 60% complete.

Extensive pipe detail assemblies will be applied to the ARS/MCN programs and the benefits eventually realized from the standards effort should prove of value to both programs.

H. Other Intermediate and long Range Plans

Nominally the long range section of the PBI plan covers the period from, 1991 to the year 2000 although both market conditions and senior manamgement attrition could accelerate the commencement of the long range plan features into the latter part of the 1980 decade. The most challenging management decisions will arise from the pending attrition and retirement of the current Peterson family officers and the effect of their determination to retain a “small business” classification in what may become an expanding marketplace. In good measure, PBI respnse to these problems will be dictated not only by the long range organization plan but also by the personal preferences of the President of PBI. For example, if the president’s preference is to concentrate on outside sales and marketing, leaving the line operations to the Vice Presidents, one organizational fern will be implied. However, if the President chooses to be the Chief Operating Officer in addition to the Chief Executive Officer then a substantially different organization will evolve. During this same period it is expected that PBI may continue to move small manufacturing operations away from the waterfront to sites in the industrial area to the north which will allow for more undercover area for module outfit and freedom of movement for ship sections. Additional ship erection positions can be created if the market demands this expansion.

1. Management Organizational charges

The proposed organizational arrangement for the long term (as shown on Chart V-7) visualizes a position of President with five Vice-Presidents, one each for Contracts Administration, Engineering, Operations, Finance and Production Services. The position of General Manager would be phased out and an Executive oVice President would be appointed as Chief Operating Officer. If the President continues to act as the principal salesman and martketing manager for PBI then the Vice-President Operations would manage the line production departments. If the President involved himself more directly in the day-to-day operations of the shipyard, it would become necessary to Strengthen Contracts Administration with a marketing group.

In this same time frame it is expected that the Vice President - Plant #2 may choose to retire and at that time PBI could either set up this plant with a General Manager or, if the business Volume remains modest, treat Plant #2 as a Production department under a Manager, with sales and marketing functions assigned to the Vice President for Contract Administration. Specifically, it is anticipated that the following changes will occur in the four major functions:

a. Engineering

The principal remaining problems facing PBI during this period will be to permanently fill the position of Vice President-Engineering and decide whether to continue using subcontract naval architectural design services or whether to develop and in-house capability to design one or more ship classes. From our present viewpoint, it is most likely PBI will continue to use subcontract designers but if the medium size ship market were to grow dramatically, PBI would have to reassess this policy to hold their leadership position in the industry.

c. Production Services

The Production Services Manager May be elevated to a Vice Presidency and will acquire the Personnel department. Four functional departments will report to this Vice President; the Planning Manager, Materials Manager, Industrial Engineering Manager and the Personnel Manager. The Quality Assurance Manager who had previously reported to the General Manager will be separated and report directly to the Executive Vice President to avoid any possible conflict of interest between organizational allegiances and either product, material or engineering quality evacuation.

d. Finance

No appreciable organizational change is espected during this period.

In the long term future of FBI, the principal constraints on corporate growth are those factors related to the limitations on the size of the labor force which FBI can employ it being a self-imposed policy to remain 2 "small business within SBA guidelines. Considering PBI's strong market -position in the "small business" category, perpetuation anti continuation of this constraint seems to be a sound business strategy. Therefore PBI must exercise other alternatives so that the available work force can produce a larger annual throughput. Patently some productivity gains will be realized by the planning and production control systems changes that are implemented during the short and intermediate range plan period. In addition some additional capacity will be realized by the planned facility changes. However, PBI must make firm plans to accompish some or all of the following if market expansion dictates major PBI capacity expansion.

a. Separate incorporation of the Pay Move r business now conducted in Plant 2.

b. Separate incorporation of all small boat construction and relocation away from the main yard, perhaps in a new plant on

the west side of Sturgeon Bay.

c. Create a major subcontract group within Procurement to transfer a much & larger volume of structural and piping sub-assembly out of the main plant.

d. Expand the craft training schools in the area in a cooperative venture with the State of Wisconsin with particular emphasis on tapping the female work force in the region.

2. Information Resource Development

PBI information resources already encompass an IBM System 3, Model 15 used for production control on current programs and for accountig use, a recently installed IBM System 38 data base oriented data processing capability for all new contracts, linked work processors, a micro filming capability for archiving, and a commitment to introduce a CADAM system with an IBM 4300 Series mainframe computer also linked to the System 38 data bases.

With the advent of the complex ARS-50 and MCM Class ships programs and an on going contract to inplement and assist the Saudi. Naval Expansion program (SNEP)Procurement System, PBI is investigating a simplification of its archiving and a cross linking of the engineering, procurement and production control data bases.

The likely archiving approach will be to use the available micro filming capability to record all currently closed contracts where future reference and retrieval will be for bidding and contract claim purposes only. A microfiche capability will be acquired by 1983 and a central archive with limited departmental microfiche ready reference record will be created for new contract records.

During 1982 the Productien Services and Engineering departments will work interactively with the data base to produce drawings, bills of material, procurement documents, work orders, budgets and schedule data while retaining the current hard copy distribution of these documents.

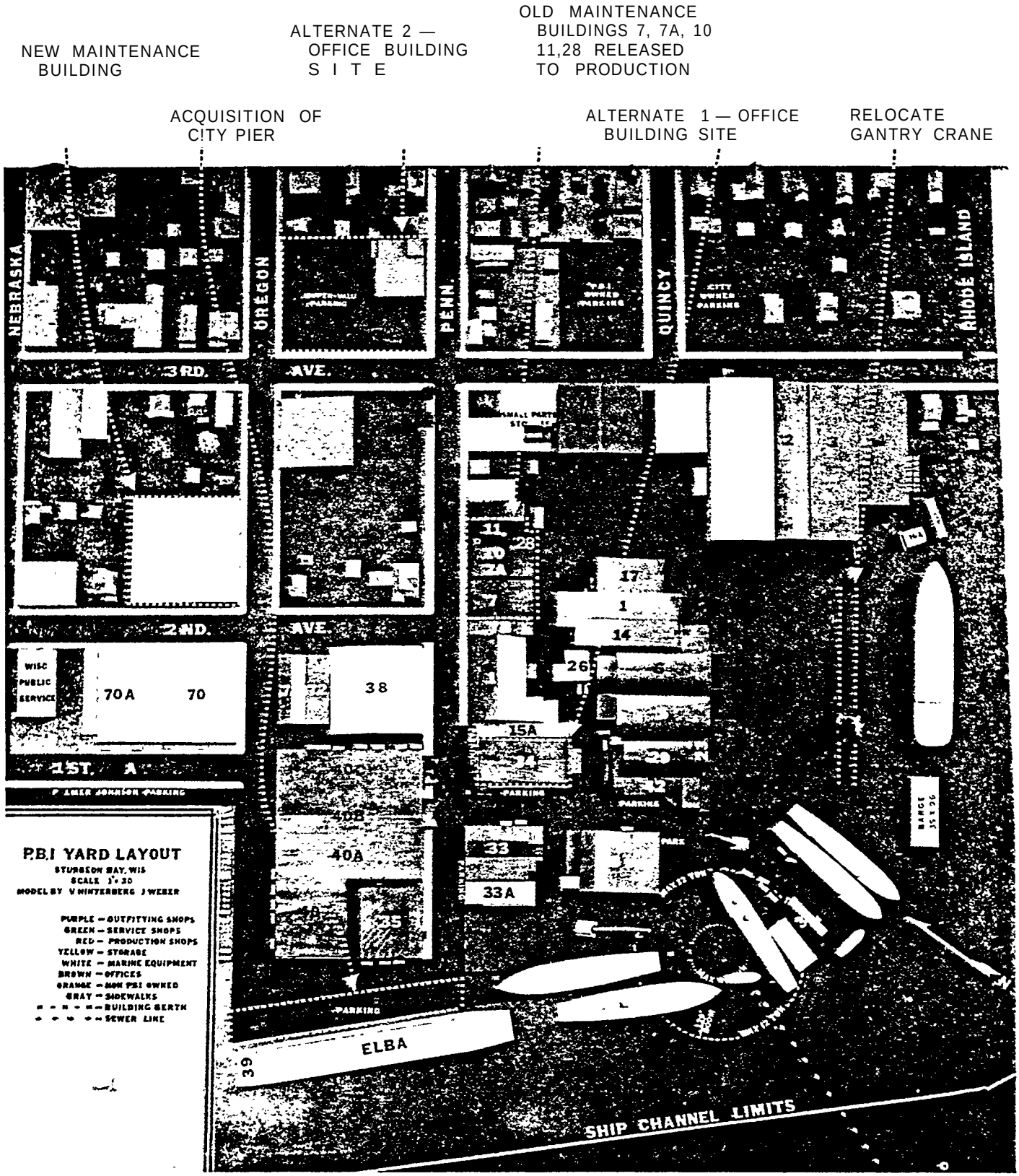
In the intermediate range, once the data base is soundly established and the communication linking is completed between the several computers and word processing stations, it is expected that departmental distribution of documents will be phased out and those groups requiring hard copies as a working document will secure them from intelligent copiers at the point of need. Nominally this would only be done when work was scheduled to be started. A continuation of this trend into the longer range future should be realized by the installation of linked personal computers and intelligent copiers at management level offices. The likely outcome of this approach will be more decentralization of staff programmers, analysts and controllers to user departments.

3. Facilities

Although the facilities modernization plans described in Sections V-E and F should satisfy mandatory contract requirements and/or produce satisfactory cost reductions, there remain some bothersome conditions which need to be addressed in the intermediate and long range facility plans for PBI. Items in this category are those whose benefits are realized mostly in management convenience or as a reaction to new market opportunities. Under consideration are improved offices, consolidation of maintenance departments, removal of PBI warehouses from Sturgeon Bay comercial redevelopment areas, acquisition Of the City pier, larger capacity docking capabilities, expanded outfit pier space, and disposition of the fixed 60 ton gantry crane. (See Fig V-8)

a. Office Requirements

At the present time, several departments at PBI are requesting additional office space. In fact, conditions are such that the entire Purchasing Department is in the process of being moved to a 1900 square foot facility rented outside the yard. Although there is a shotage of office space, and the offices are, in many instannces, located in aged wooden facilities, there is, at the moment, no truly urgent requirement for additional or new office space. However, as a part of the intermediate and certainly the long range facilities plan, the possible, if net probable, need for increased office facilities must be considered.



PBI — INTERMEDIATE AND LONG RANGE, FACILITY OPTIONS

Figure V-8

Currently the following office space *is mailable at* PBI

Production offices	10,200 Sq ft
-Accounting and Data Processing	7,500 Sq ft
Engineering	15,200 Sq ft
EXecutive Office	3,700 Sq ft
purchasing (outside lease)	1,900 Sq ft
Production Services	6,000 Sq ft
Personnel	1,200 Sqft
Industrial Engineering	1,200 sq ft
Total Office Space	46,000 sq ft

Included in this total is 10,200 sq. ft. of existing shop office space which should remain decentralized at the applicable shops and not relocated to the new office building.

Net office space which can effectively be centralized is approximately 36,000 sq. ft. Two alternatives are actively being considered to provide improved office facilities.

1. Alternative 1

   Construct a new office building outside the present yard perimeter on property yet to be acquired. The building would house all the identified functions in the 36,000 sq. ft. requirement. For one nearby site, a tentative building arrangement was developed including two office floors of 150’ x 130’ witlh one street level parking lot below to satisfy

Sturgeon Bay off street parking codes and with a 10% space expansion allowance.

2. Alternative 2

Allow the Engineering Department and Data Processing Center to retain presently occupied spaces but with Engineering undergoing a rearrangement which could create space for a 10 to 15% personnel expansion. The balance of office space required would then be about 18,000 sq. ft.

This requirement can be met in an excellent geographic location by constructing two new 5000 sq. ft. office floors above the old Freezer Plant (Building 34) . These floors combined with the 7800 sq. ft. presently in use on the ground floor by Production Services and Personnel satisfy the area demanded.

Office Recommendation

Although the new consolidated office outside the yard offers the benefits of complete consolidation and centralization, reduction of in-yard automobile parking, and elimination of office disruption during construction it does not appear to be superior to the Freezer Plant expansion plan. The latter option offers significantly lower costs and far superior access to the shipyard.

b. Maintenance Facility

For some time the PBI maintenance department has been housed in several buildings (e.g. Nos. 7, 7A, 10, 11 and 28) . At a future date, if waterfront production space is urgently needed, there is potential benefit in constructing an off-site maintenance building thereby releasing these spaces. The facility usage studies so far do not provide justification for such a move.

c. Sturgeon Bay Redevelopment Actions

During the intermediate stages of shipyard development it is anticipated that the City of Sturgeon Bay community plans will begin to have an affect on the development of properties adjacent to PBI and in particular on some of the outlying buildings in the proposed City redevelopment area. Of particular interest to PBI is the potential for abandonment, acquisition and transfer of some of these properties including; PBI Warehouse Building 50, the building housing the U.S. Navy Supervisor of Shipbuilding ofifice and as a corollary the City Pier and its access streets which might be acquired by PBI. Since a successful accommodation with the City of Sturgeon Bay could prove mutually beneficial to both the City and to PBI, it is expected that imaginative planning can lead to the following facilities changes in the intermediate range future:

1. PBI should move to acquire the pier presently leased from the City of Sturgeon Bay and “the adjacent area including Oregon and Pennsylvania Streets from 2nd Avenue to the Bay frontage road. This pier then provides one additional large ship outfit berth.

2. Concurrently PBI should divest itself of the Warehouse Building 50 and the building housing the U.S. Navy offices. To accomplish this the Allowance Material storage as well as other stores will have to be relocated. In addition PBI should negotiate with the redevelopment agency to have a developer construct a new office building fox the Supervisor of Shipbuilding Offices which could be leased by the U.S. Navy for the foreseeable future on a site amenable to community development plans and with easy access to PBI.

3. Since preliminary discussions with the City of Sturgeon Bay have imdicated their desire to limit PBI expansion to the east of Third Avenue, PBI should relocate their existing parking lots at that location to one to the west of Third Avenue in the area recently rezoned for commercial and industrial uses.

d. Drydocking Capability

As an alternative to the new bulkhead described in section V. F. 3, PBI is studying the acquisition of a new floating drydock to provide both the increased capacity of a new dock and comparable ship hull section access to the planned new high bay building. This dock would have a removable side wall on the shore side. Storage of this wall in turn would create storage problems for the already constricted main yard. If a sharp increase in market demand for ship repair work is experienced by PBI, this option will require careful consideration but current conclusions are that this approach is much less satisfactory than the new bulkhead in spite of attractive tax and investment financial benefits. The floating drydock effectively removes a badly needed outfit berth from service and is generally less satisfactory for new construction hull erection. Furthermore, due to Sturgeon Bay winter harbor ice conditions, a floating drydock will be relatively unproductive during winter months.

e. Gantry Crane

PBI has a 60 ton traveling gantry crane presently installed in a fixed location wnich provides little service to production. The most beneficial disposition of the crane is an outright sale, using the profits to procure a mobile crane, if yard lifting requirements justify such an acquisition. However,

depending on the combination of pier usage and bulkhead modernization developments which occur, PBI will consider returning the gantry to service as a rail mounted crane at either of two locations. One location would be for use as an outfit crane at Berth l1 with possible future extension to the City Pier. The second possibility is for service to new construction at the proposed new outboard bulkhead near Berth 2. Since the gantry is electrically powered, the need for cable troughs inhibits its usefulness at these locations.

VI. FACILITY PLAN ASSUMPTIONS AND CONSTRAINTS

The development of a business and facility plan for PBI is constrained (and perhaps in some situations enhanced) by the physical limitations and somewhat limited labor resources of the Door County peninsula in northeastern Wisconsin. The PBI mission and marketing objectives have been described in general terms in Sections II and III. The following paragraphs will define and extend the implications of this market on the facilities plan and will describe the geographical, labor, financial, governmental competitive and technical constraints on the future plans for PBI.

A. Existing Plant Limitations

The plant capacity in 1981 may be described in several theoretical ways, for example in terms of the space capacity for relatively simple space intensive commercial ships similar to the 225' /1200 DWT tuna seiners now under construction, or the complex labor intensive PGG gunboats or finally in terms of fully utilizing a 1000 employee work force dictated by the SBA ceiling. To illustrate these conditions:

1. Five 225' tuna seiners per year essentially saturate the major physical facilities at PBI but require a workforce of less than 500 direct production (and less than 600 total) employees.

2. Five 192' PGG's per year saturate the SBA manpower ceiling with approximately 850 direct production and a total employee workforce near 1000 although the physical plant could acccomodate six PGG's per year.

3. The 1000 employee SBA ceiling limits direct production labor to 850 employees or about 1,700,000 manhours available per year for same commercial/government product mix.

Other obvious limits on present ship construction are the launching length of about 300', drydockirg at about 1800 tons and the ship delivery constraints described in later paragraphs on geographical limits. Drydocking of much larger ships can be accomodated at the adjacent Bay Shipbuilding Co. if this ever becomes a limiting factor.

The relatively severe winter conditions at PBI promote indoor module construction an zone outfit. PBI presently uses six major module and ship assembly buildings (Ship 1, Ship 2, Ship 3, Ship 4, Ship 6, and Building 40). The building size and door openings have been adequate for indoor work on current product lines (PGG and Tuna Seiners) and all but the largest previous ships constructed. However, without substantial facility modification, the present buildings do constitute a limitation on indoor zone outfit of larger ship modules and force less than optimum module breakdown on some future ship programs.

B. Workforce

The workforce available to PBI has several features directly related to Wisconsin geography and PBI market goals. The shipyard, situated as it is at the upper end of a narrow Peninsula approximately 75 miles long and

consisting of Door and Kewaunee Counties with a combined population of about 44,000 and a workforce of 23,000 has access to skilled labor pools principally from Green Bay, Wisconsin north along the peninsula. In the three shipyards in Sturgeon Bay (nominal population of 8,500) approximately 3000 people are employed. The closest major population centers are Milwaukee and Green Bay, 140 miles and 42 miles respectively. PBI is situated in a geographical region subject to extremely cold winters, albeit temperate summers. In addition PBI's market consists of relatively complex high technology ships. With this background, PBI competes for labor in a limited Pool, against strong adjacent shipyards within the comnunity, and within a geographic area otherwise dedicated to farming. l For these reasons, rapid increases in the size of the PBI workforce are difficult, " however previous World War II experience demonstrated that the area could generate a shipbuilding workforce of over 7000 people. with only 81/2% of its workforce made up of women, there may be an opportunity to look to this resource if future market developments require a significant increase in personnel.

C. Geographical Conditions

Shipbuilding, with its massive and waterborne end prcduct is more at the mercy of geography than most construction and manufacturing industries. Shipyards throughout the country continually identify and commiserate with each other concerning the difficulties of construction within the varying climatological and geographical constraints they suffer. Wisconsin has its list of advantages and difficulties, some of which are catalogued hereafter:

1. Climate

Temperature ranges for PBI vary from a January mean Of 17.5 (°F) to a July mean of 68.3 (°F) with the mean extremes being about ten degrees lower and higher respectively. Precipitation annually is about thirty inches with a monthly range from about one inch in the winter to almost 31/2" in the summer. Mean annual snowfall is just under 37 inches. With these conditions, PBI enjoys reasonably mild weather from April through october but must contend with a frozen Sturgeon Bay which harpers launchings and precludes Waterborne deliveries from December at least through March.

2. Plant Access

The PBI shipyard is located on Sturgeon Bay which is connected to Lake Michigan via a ship canal and through the natural waterway to Green Bay and thence to Lake Michigan also. Access to Lake Michigan is constrained by U.S. Army Corps of Engineers channels which have a Project depth of 22′ and with maintained depths varying from 17′ to 22′. Further the yard is placed between a highway bridge with a horizontal clearance of 162′ with an unlimited bascule vertical opening and the Michigan Street bascule bridge with a 139′ horizontal clearance ans an unlimited vertical when opened. ln addition to these limitation *on* the size of ships Which can be put into service *on* Lake Michigan *are the* limits imposed on access into the other Great Lakes and onward to either the Atlantic Ccean or the Gulf of Mexixco via the St. Lawrence Seaway/Welland Canal system and the Illinois Waterway/f-Mississippi system respectively. The shipbuilding

dimensions imposed by these system are:

	Length	Beam	Draft	Height
St. Lawrence (Atlantic)	730 '	75′-6″	25′-9″	117 ′
Mississippi (Gulf of Mexico)	600'	80'	9′	16' - 9"

For the foreseeable future the constraints imposed by access to the ocean are so much greater than the existing construction limitations imposed by the shipyard facilities, that ship delivery does net constrain the long range plans of PBI.

Road access is of some importance to PBI since both steel plate and steel fabrications are regularly transported to PBI from the nearest railhead and a typical structural subcontractor at Kewaunee, Wisconsin about thirty-two miles to the south. The annual wide load highway permit issued to the subcontractor adequately describes the existing roadway limitations *for* access to PBI at, length - 65′, width - 17′-6″, and height - 16′. There is no remaining rail service to Sturgeon Bay. Small boats to 65′ in length Can be delivered across the continent by truck transport, and barge transport for oversize loads is readily available from the Green Bay area. Vessels up to 100′ can be deck transported by sea going vessels servicing the ports of Green Bay and Milwaukee.

3. Soil Conditions

Soil conditions for a shipyard of the PBI type are reasonably good for facilities construction at the main yard site. U.S. Department

of Agriculture and State of Wisconsin Department of Natural Resources soil surveys and planning reports have described the site as "suitable for urban development and faming" and ".. with bedrock at 12" to 42". Further the yard areas consist of Longrie Loam with O to 2% slopes (Symbol LoA) in the western and northern sides, Cobbly Udorthents (Symbol Uo) on the east side and Cut and Fill Land (Symbol #) at the Point. These conditions provide a solid foundation for industrial construction and the level land poses no important restrictions on adjacent expansion.

D. Technical Considerations

The PBI pursuit of the medium size complexs and unusual ship market demands considerable technical competence in engineering, management, trade and craft skills, and facilities. While the excellence of the ships currently being delivered by PBI certainly demontrates an adequate level of tecchnical competence there is never-the-less some evidence of weaknesses which need attention in the intermediate and long range plans of the corporation.

For example, PBI depends on subcontracted Naval Architecture agents for its ship designs and has an in-house engineering and drafting group which concentrates mostly on design changes and troubleshooting production problems. An Engineering Department large enough to produce a complete ship design is not presently being envisioned. The remoteness of some design agents has, in the past created some prduction liaison problems. With new major programs, PBI is arranging to use engineers resident at

the design agents to improve both communication and design quality. Altlhough through long experience in laminated wood, steel, aluminum and fiberglass construction, PBI has acquired considerable in-house technical capability in these materials, their recent experience with the PGG Program has rapidly expanded both their exposure and skills in handling the problems associated with sophisticated and exceptionally complex Navy combat vessels. Some of the more obvious areas of growth are in design agent control, painting and coating system, use of reck-ups or computer aided design to sinplify densely packed machinery rooms, production engineering liaison, and engineering schedule and manpower control.

In the management area, PBI is facing government contracts which may insist on adherence to the Cost/Schedule Control Systems implicit in either DCD 7000.10 or DOD 7000.2. Although none of the senior managers have previously been exposed to these requirements in an operating shipyard, the need for considerable management and employee education and procedure reorganization is recognized, managers have completed training courses and efforts are underway to allow a comfortable transition to this type contract.

E. Utilities

PBI secures water and electricity from the Sturgeon Bay Utilities and natural gas from Wisconsin Public Service Company. Although the area is bounded by large fresh water lakes and bays (Lake Michigan and Sturgeon Bay) , the community water supply is developed from six wells in the Niagara Limestone Aquifer at varying depths from 298′ to 1178′. In a

recent year usage averaged about 335,000 gallons per month with peak months approaching 450,000 gallons. Electrical usage averages about 603,000 KWH per month with peaks approaching 900,000 KWH. Natural gas which is principally used for plant heating averages close to 3,000,000 cu. ft. per month with peak months at greater than 8 million cubic feet. PBI is connected to the City of Sturgeon Bay sewage system. The City has recently completed a new sewage treatment facility significantly increasing system disposal capacity.

Since none of the facility plans for PBI involve major expansaion in physical plant or personnel expansion, it is not expected that PBI will make demands on the local utilities much in excess of present peaks. If PBI is successful in increasing its capacity by 15 to 20% within the next several years they may anticipate an increase in average electrical demand of about the same magnitude.

F. Governmental Influences

The principal government impact on the facilities development at PBI is felt through local zoning regulations, through compliance with State of Wisconsin Department of Natural Resources regulations concerning environmental impact, and through the desirability of avoiding conflict with City of Sturgeon Bay and Door County comnunity development plans. In general the community appears to consider PBI as a “good neighbor” and PBI’s owners have consistently supported good relations with the City, however the location and relocation of some of PBI’s future facilities should be planned to enhance c ommunity development goals. There also

exists some potential for PBI to replace some of their less desirable outlying buildings by sale or transfer and replacement with new buildings at locations more in keeping with the City plans for downtown Sturgeon Bay. In the environmental area Wisconsin DNR is nominally the enforcement agent for federal environmental regulations and within this framework PBI must be alert to maintain a position of essential compliance with the federal and state regulations to avoid establishing an adversary relationship to DNR which could hamper PBI plans for the future.

1. Zoning

The Peterson shipyard is located within an I-2 District which allows "any industrial use . . . except those that would present a danger to residents of the community or would generate noise, smoke, traffic or air or water pollution that would create a public or private nuisance. Emphasis is placed on providing land for warehousing and light assembly industries . . . (and) . . may normally include the use of heavy machinery and may require outdoor storage areas for raw materials and/or finished products. Residential, commercial or public uses are prohibited. " Buildings within the district are limited to 45 feet in height and one parking space shall be provided for each three employees. However PBI has secured a zoning variance for a proposed new ship construction building with an cave height of 75 feet. The shipyard property is

bounded on the east by Residential R-2 and R-4 Districts and to the north by a Commercial C-1 District. Recently PBI has Succeded in securing rezoning of some of the abutting Commercial District to Industrial use thereby eliminating one constraint on future expansion to the north.

2. Community Development

Planners for the City of Sturgeon Bay and Door County have been pursuing plans for City (and downtown) redevelopment which they hope to bring to fruition within the next five years and which, in some situations, both channel and enhance PBI plans for development on the east side of Sturgeon Bay. Typically the planners wish to avoid any further intrusion of PBI east of Third Avenue. In particular they look to a reduction of the off street parking lots that PBI now maintains in this area and a relocation of this activity to the Commercial and Industrial Districts to the north. Further they would like to see an abandonment of PBI industrial and warehousing activities north of Michigan Steet, an area which figures strongly in the City's downtown development plans. Most affected are the existing offices that PBI maintains for the U.S. Navy Supervisor of Shipbuilding offices and some warehouse buildings along Second Avenue. Neither of these options are particularly critical to PBI operations and if a suitable buyer can be found to convert these buildings to downtown Commercial use without loss to PBI it would appear that a trade-off for less remote locations within the Industrial District might be arranged with the redevelopment agency. This-

could be beneficial to both PBI and Sturgeon Bay. These moves would be consistent with some of the general objectives for Sturgeon Bay cited in earlier State of Wisconsin planning studies, for example:

> "discourage bayfront industrial development in the central city"
>
> bayfront industries and shipyards "need offstreet parking and limited space for expansion" on the east side
>
> "all new industry should go to the west side"

3. Environment

With the significant exception of the occasional open air blasting conducted by PBI, this shipyard is environmentally quite clean in comparison to many shipyards in the country. The yard has succeeded in complying with Wisconsin DNR water pollution control requirememts and other than those operations associated with abrasive blasting and painting creates little in the way of noxious fumes and smoke. The construction of a new blast and paint facility late in 1980 has enabled PBI to greatly reduce the blast and paint emissions. Although few hazardous waste materials are generated by the yard, new federal regulations have become much more demanding. A critical review of this area has been conducted by an outside consultant which confirmed that PBI meets Wisconsin Department of Natural Resources standards and to to insure that routine yard operations are not contributing candidates for hazardous material control. None of the likely expansion plans for the east side facility are likely to

substantially increase either water, air or noise pollution so PBI's most pressing environmental activities are to insure compliance with existing air pollution standards and to keep pace with the rapidly changing hazardous wate material disposal regulations.

VII PLAN SUMMARY AND ACIIONS

Although the foregoing sections clearly demonstrate that great progress has been made in implementing the short range plan and even in accomplishing some intermediate goals at an accelerated rate, there remain some difficult and major decisions facing PBI managemmt during 1982. Periodically thereafter it is anticipated that this plan should be reevaluated and updated to accommodate presently unforeseen, market, labor, technological and financial excursions.

From the studies and actions described in Section V of this plan we can conclude:

a) In the short range PBI has weathered a difficult period in 1980 and 1981 and with significant changes in organization and methods being identified and implemented, has recovered control of its PGG and Tuna programs and is soundly based. to exploit the additional changes implied by the ARS and MCM prcgrams.

b) With the advent of ARS and MCM's in the latter part of the short range and into the intermediate range, PBI must complete actions already underway. (See Fig. VII-1) The most important of these actions axe:

1. Complete the “Company Wide System” development particularky in the areas of materials management, intergrated PPC, and confirmed compliance with DOD 7000.10.

2. Authorize and construct the facilities required for high productivity construction of ARS and MCM ships. Of particular urgency are the construction of the new high bay ship construction building (targeted for completion by November 1982) and either conversion of part of plant 2 into a modern wood laminating facility or construction of a new state-of-the-art facility, there being none now in the United States specifically for marine laminating.

3. Creation of a computerized integrated engineering, materials, and production data base as the vehicle for implementing the Company Wide System in a cost effective manner.

4. In this same period PBI should take concrete steps to resolve their interests in the City Pier, further use of Warehouse 50/51, replacement of the Navy office in a location more amenable to Sturgeon Bay redevelopment plans, dry dock acquisition, revised Parking, office and maintenance facilities.

c) For the longer range, PBI should reevaluate this plan at least bi-annually, but preferably annually, concurrent with capital budget preparation for the following fiscal year and u-palate the plan as dictated by exceptional, market, labor and financial conditions. Some of the key elements requiring periodic attention will be:

1. Stabilizing the senior management organization and strengthening management training to support a PBI developed succession plan.

2* Securing fully integrated management information *resources.*

3. Remaiming alert to market opportunities which might require revision to PBI's SBA compliance.

In summary, PBI with the short range program well underway and with an assured ARS, three ship program, is substantially stronger than it was at the commencement of this plan. Both its facilities and its personnel have gained flexibility and greatly enhanced control of its business decisions. Enlightened application of these revised programs to the next ARS and MCM generation should provide the vehicle for solid long range development and success of an even more competitive and profitable shipyard.

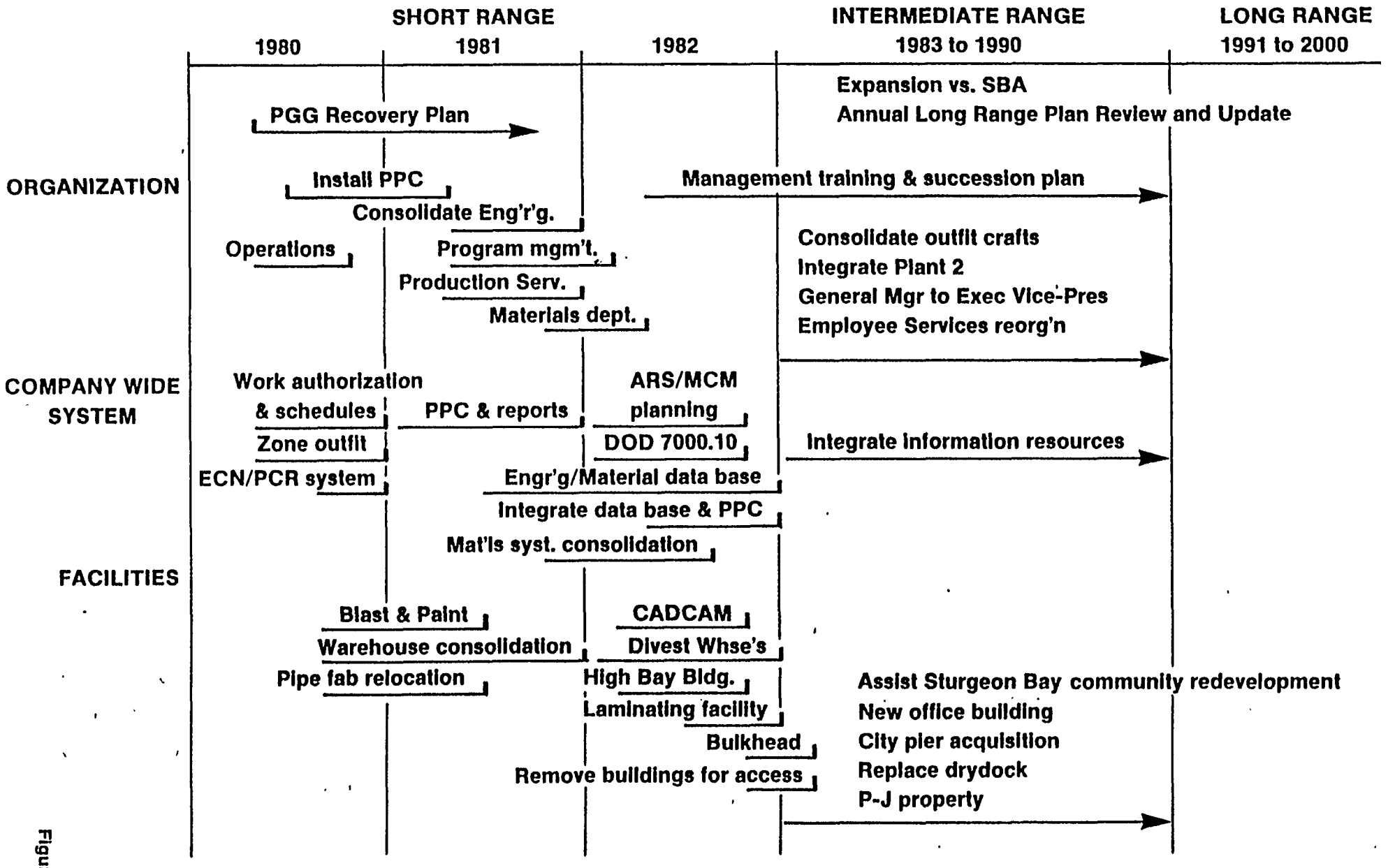


Figure VII-1

PLAN SUMMARY AND ACTIONS

STANDARD FORM 17
October 1965
DEPARTMENT OF THE NAVY (BUSHIPS)
& MARITIME ADMINISTRATION
Coordinator for Ship Repair
and Conversion (DOD-DOC)

Form Approved
OMB No. 45 R0286

FACILITIES AVAILABLE FOR THE CONSTRUCTION OR REPAIR OF SHIPS

DATE

TO: *(Complete departmental address)*

SHIPYARD AND ADDRESS
Peterson Builders, Inc.
101 Pennsylvania Street
Sturgeon Bay, Wisconsin 54235

INSTRUCTIONS
(Forward original copy to appropriate Department of Defense Office or Maritime Administration, Washington, D.C.)

BUILDING WAYS (M.L.W.)

NO. OF WAY	LAUNCHING (Check one)	DIMENSIONS	MAXIMUM SHIP SIZE (Ton 2,240 lbs.)	DEPTH OF WATER: Over way end	DEPTH OF WATER: At drop off	CONDITION OF WAY	CRANES SERVING WAY: No.	CRANES SERVING WAY: Type (Plus hook height for bridge cranes)	CRANES SERVING WAY: Lift Capacity (Std. tons)
74	[ ] End [X] Side [ ] Basin	Length 225' Width 50' Depth 25'	Length O.A. 220' Beam 20' Weight 2000		16'	EXC.	1	1 - Crawler 1 - Crawler	200 100
72	[ ] End [X] Side [ ] Basin	Length 325' Width 70' Depth 25'	Length O.A. 300' Beam 60' Weight 2000		20'	EXC.	3	1 - Crawler 1 - Mobile 1 - Gantry	200 100 60
Bldg 1	[X] End [ ] Side [ ] Basin	Length 175' Width 50' Dock 30' HT	Length O.A. 170' Beam 30' Weight 275'	17'		EXC.	2	Bridge (31') Bridge (29')	15 3
Bldg 2	[ ] End [X] Side [ ] Basin	Length 225' Width 50' Dock 34' HT	Length O.A. 210' Beam 40' Weight 1500		17'	EXC.	2	Bridge (30') Bridge (27')	15 5
Bldg 3	[ ] End [X] Side [ ] Basin	Length 225' Width 68' Dock 36' HT	Length O.A. 190' Beam 40' Weight 1100		17'	Very Good	4	Bridge (30')	5
Bldg 5	[X] End [ ] Side [ ] Basin	Length 128' Width 60' Dock 18' HT	Length O.A. 120' Beam 24' Weight 150'	17'		EXC.	2	Bridge (18')	3
Bldg 6	[X] End [ ] Side [ ] Basin	Length 165' Width 60' Dock 25' HT	Length O.A. 110' Beam 22' Weight 150'	10'		EXC.	1	Bridge (25')	3
Bldg 21	[X] End [ ] Side [ ] Basin	Length 175' Width 30' Dock 25' HT	Length O.A. 144' Beam 26' Weight 175'	10'		Good	1	Bridge (25')	3
Dry Dock 39	[X] End [ ] Side [ ] Basin	Length 374' Width 52' Depth 25'	Length O.A. 342' Beam 39' Weight 1800	14'		EXC.	3	1 - Crawler 1 - Gantry 1 - Crawler	100 60 200
	[ ] End [ ] Side [ ] Basin	Length Width Depth	Length O.A. Beam Weight						

LENGTH OF LAUNCHING RUN	DEPTH OF RUN AT M.L.W.	TIDAL RANGE (Difference M.L.-M.H.)	IS FIRE PROTECTION AVAILABLE ON BUILDING WAY?	IS SHUBUNKING NECESSARY
	14 Feet	NONE	[X] YES [ ] NO	[ ] YES [X] NO

17-101

* GPO: 1976-208-566

Sheet 1 o

VIII. Appendix B. StandardForm 17

SHIPS' BERTHS (PIERS, WHARVES, BULKHEADS, MOORING DOLPHINS (T.L.W.)

NO.	TYPE	LENGTH (Actual and usable)	WATER DEPTH Inboard	WATER DEPTH Outboard	HEIGHT OF DOCK	USE REPAIR AND/OR OUTFITTING	SERVICE AVAILABLE (Use abbreviations of services and units of measure notated under legend)	CRANES SERVING BERTHS, ETC. No.	CRANES SERVING BERTHS, ETC. Type (Hook height above M.L.W.)	CRANES SERVING BERTHS, ETC. Lift Capacity (Standard tons)
1	BHD	Act. 130' Use. 140'	14'	16'	3'	Both	E-220/440 VAC A 90 PSI	4	Mobile - 60' 80'/90'/20'	Lift 15/12/100/12 Reach 60/80/90 20'
2	BHD	Act. 219' Use. 240'	14'	16'	3'	Both	DITTO	4	DITTO	Lift DITTO Reach DITTO
3	PIER	Act. 110' Use. 195'	12'	16'	3'	Both	E-220/440 VAC A 90 PSI	4	DITTO	Lift DITTO Reach DITTO
4	BHD	Act. 110' Use. 120'	12'	16'	3'	Both	S-P 30 PSI E-220/440 VAC A 90 PSI	4	DITTO	Lift DITTO Reach DITTO
5	BHD	Act. 120' Use. 200'	13'	15'	3'	Both	DITTO	4	DITTO	Lift DITTO Reach DITTO
6	BHD	Act. 160' Use. 220'	14'	16'	3'	Both	E-220/440 VAC S-P 30 PSI A 90 PSI	4	DITTO	Lift DITTO Reach DITTO
7	BHD	Act. 210' Use. 240'	14'	18'	3'	Both	DITTO	4	DITTO	Lift DITTO Reach DITTO
8	BHD	Act. 80' Use. 240'	14'	18'	3'	Both	S-P 30 PSI E 220/440 VAC A 90 PSI	4	DITTO	Lift DITTO Reach DITTO

DRYDOCKS (mean HIGH water) (List building docks under building ways)

DOCK NO.	MATERIAL CONSTD. OF—TYPE Floating—(FD); Graving—(GD); Marine Railway—(MR)	MAXIMUM SHIP SIZE ACCOMMODATED LENGTH OA-BEAM	LENGTH Overall	LENGTH At coping (GD); on pontoons (FD)	LENGTH At keel blocks; on cradle (MR)	CLEAR WIDTH At top; cradle (MR)	CLEAR WIDTH At keel blocks	DEPTH/DRAFT Over sill (GD)	DEPTH/DRAFT Over floor	DEPTH/DRAFT Over keel blocks	LIFTING CAPACITY (Ton 2,240 lbs.)
39	Steel Drydock (F.D.)	342' x 40'	374'	360'	342'	40'	42'	16'	17'	14'	1800
41	Wood/Steel Marine Railway	170' x 28'	100'	---	100'	35'	32'	--	14'	12'	250

LEGEND: (Abbreviations of Services)

Fresh water ..... F.W.-G.P.M.-P.S.I. Steam ..... S-P/HR-P.S.I. Electric power ..... E-V-AC-AMP Fire protection ..... FP-G.P.M.-P.S.I.
Salt water ..... S.W.-G.P.M.-P.S.I. Air ..... A-C.F.M.-P.S.I. Electric power ..... E-V-DC-AMP Sanitary sewer ..... SS-Yes or No

*** F.W. at City Pressure and F.P. at 60 PSI - ALL BERTHS

Con't on Page 2A of 6

SHIPS' BERTHS (PIERS, WHARVES, BULKHEADS, MOORING DOLPHINS (M.L.W.)

NO.	TYPE	LENGTH (Actual and usable)	WATER DEPTH Inboard	WATER DEPTH Outboard	HEIGHT OF DOCK	USE REPAIR AND/OR OUTFITTING	SERVICE AVAILABLE (Use abbreviations of services and units of measure notated under legend)	CRANES SERVING BERTHS, ETC. No.	CRANES SERVING BERTHS, ETC. Type (Hook height above M.L.W.)	CRANES SERVING BERTHS, ETC. Lift Capacity (Standard tons)
9	BHD	Act. 150' / Use. 220'	12'	20'	3'	Both	E-220/440 VAC A 90 PSI	4	Mobile 60' 80'/90'/20'	Lift 15/12/100/12 Reach 60/80/90 20'
10	BHD	Act. 120' / Use. 150'	15'	20'	3'	Both	DITTO	5	4 - Mobile 1 - Gantry 190'	Lift 60 Reach 120'
11	BHD	Act. 410' / Use. 550'	20'	24'	3'	Both	DITTO	5	DITTO	Lift DITTO Reach DITTO
		Act. / Use.								Lift / Reach
		Act. / Use.								Lift / Reach
		Act. / Use.								Lift / Reach
		Act. / Use.								Lift / Reach
		Act. / Use.								Lift / Reach

DRYDOCKS (mean HIGH water) (List building docks under building ways)

DOCK NO.	MATERIAL CONSTD. OF—TYPE Floating—(FD); Graving—(GD); Marine Railway—(MR)	MAXIMUM SHIP SIZE ACCOMMODATED LENGTH OA–BEAM	LENGTH Overall	LENGTH At coping (GD); on pontoons (FD)	LENGTH At keel blocks; on cradle (MR)	CLEAR WIDTH At top; cradle (MR)	CLEAR WIDTH At keel blocks	DEPTH/DRAFT Over sill (GD)	DEPTH/DRAFT Over floor	DEPTH/DRAFT Over keel blocks	LIFTING CAPACITY (Ton 2,240 lbs.)

LEGEND: (Abbreviations of Services)

Fresh water..... F.W.–G.P.M.–P.S.I.
Salt water..... S.W.–G.P.M.–P.S.I.
Steam..... S–P/HR–P.S.I.
Air..... A–C.F.M.–P.S.I.
Electric power..... E–V–AC–AMP
Electric power..... E–V–DC–AMP
Fire protection ..... FP–G.P.M.–P.S.I.
Sanitary sewer..... SS–Yes or No.

PRINCIPAL SHOPS AND BUILDINGS

NAME OF SHOP OR BUILDING	DIMENSIONS OF SHOP OR BUILDING	MATERIALS PROCESSED (See note)	LARGEST EXIT Width	LARGEST EXIT Height	WEIGHT OF MATERIAL OR NUMBER AND SIZE OF UNITS PRODUCED PER 8 HOURS (See note)	ALL OTHER SHOPS (List names and dimensions, include mold loft, if any)
Fabricating	23'x90'/24'x90'	Alum./Steel	27.5'	20'	Varies	
Fabricating	56'x90'/60'x75'	Alum./Steel	27'	17.5'	Varies	Test Cell 32' x 93'
Fabricating	60'x128'/100'x150'	Alum. Steel	22'	21'	Varies	
Plate	36'x77'/180'x200'	Steel	x x x x	x x x x	Varies	Mold Loft 60' x 200'
Sheet metal	22'x130' 80'x120'	Alum./Steel	18'	14'	Varies	Mold Loft 27' x 190'
Subassembly	23'x25' 25'x29'	Alum./Steel	20'	28'	Varies	Mold Loft 60' x 128'
Carpenter	71'x99'	Plywood/Wood	x x x x	x x x x	x x x x x x x	
Laminating	27'x190'	Wood	x x x x	x x x x	x x x x x x x	Insulation Shop 33'x38'
Woodworking	60'x100'	Wood				
Boat assembly or molding	50'x175'/50'x225'/60'x165' 68'x225'/37'x99'	Alum./Wood	50'	29'	Varies	West Side Fab. Bldg. 200' x 200'
Machine	85'x130' 32'x130'	x x x x x x	x x x x	x x x x	x x x x x x x	
Electrical	74'x108' (2 floors)	x x x x x x	x x x x	x x x x	x x x x x x x	
Electronic	16'x37' 20'x40'	x x x x x x	x x x x	x x x x	x x x x x x x	
Pipe	40'x71' 33'x51'	Stl./Stn. Stl. Copper & Alum.	12'	20'	Varies	
* Fiberglass	44'x136'	Reinforced Plastic	12'	14'	Varies	
Galvanizing						
Paint Shop	60'x100'		48'	32'	Varies	
Foundry Blast	60'x100'		48'	32'	Varies	
Outfitting	61'x135'/24'x40'					
Forge	24'x64'(2 floors)	x x x x x x	x x x x	x x x x	Varies	

NOTE.—Indicate materials as: steel, aluminum, reinforced plastic, wood, plywood, sheet metal, etc.

SHOP OR YARD CRANES (5 tons or over)

BRIDGE TYPE Cap. Std. tons)	BRIDGE TYPE Max. span	BRIDGE TYPE Height of hook	BRIDGE TYPE Area/shop serviced	STATIONARY, RAIL OR MOBILE Type	Cap. (Std. tons)	Max. reach	Capacity at reach	Boom length	Height hinge	Area serviced	Hgt of hook above base at out reach
20	30	20	Test Cell	Gantry	60	110	15	120	70'	West Dock & Drydock	60
15	50	29	Fab. Shop	Mobile	80	140	20	160	12'	Entire Yard	15
10	64	31	Fab. Shop	Mobile	12	60	3	70	10'	Entire Yard	8
15	50	32	Fab. Shop	Mobile	25	40	5	45	10'	Entire Yard	8
(2) 11	60	28	Fab. Shop	Mobile	4	15	1	18	7'	Entire Yard	6
5	60	24	Fab. Shop	Mobile	4	15	1	18	7'	Entire Yard	6
				Mobile	4	15	1	18	7'	Entire Yard	6
				Mobile	200	115	12½	190	7'	Entire Yard	15

* NOTE: May move to larger building if need arises

MAJOR ITEMS OF MACHINE TOOLS AND EQUIPMENT (List briefly such of the large items as will indicate the capacities of all important shops in maximum work piece size, e.g., 30' plate bending rolls, 10' plate shears, 400 ton Hyd. press, 30' plate furnace, engine lathe 36" x 20" b.c., etc.)

1 - Electric Eye 6 Torch Automatic Flame Cutting Machine

1/4" x 6' Bending Roll	1 - Angle Roll
1/4" x 10' Shear	1 - 75 Ton Press Brake
1/2" x 10' Shear	2 - Strippet Fabricators
90 Ton Press Brake	1 - Swing Arm Router
200 Ton Press Brake	1 - Horizontal Bore Mill
2 - 300 Ton Press Brakes	1 - Cincinnati Mill Machine
7 - Lathes up to 24" x 8'	1 - Turret Lathe
80 - Welding Machines	4 - Radial Arm Drill Presses
30 - Aircomatic Machines	5 - Marvel Band Saws
20 - Heliarc Machines	9 - 60 Ton Moving Dollies
1 - 20,000# Forklift Truck	1 - Conrac Pipe Bender, 2" - 6"

1 - Buffalo Roller for angles and flat bar.
3 - Baker Side Loaders, 10,000-30,000# capacity.
18 - 2,000-10,000# Forklifts
1 - 100 Ton Manitowoc Crane Crawler
1 - 60 Ton Gantry Crane
5 - Mobile Cranes - 3 to 15 ton.
1 - 200 Ton Manitowoc Crawler Crane.
1 - Computer Numerical Controlled Plasma Cutting Machine

Boring Bars - 2" to 5" and up 30' in length.
Heat Treat Oven
K & E Optical Tooling Bars, stands transit

Laminating jigs for frames in vessels to 40' beam. Complete equipped shipyard, punches, drills and all equipment necessary for steel, aluminum and wood.

Complete facilities to furnish equipment and shops for the following trades: Electrical, electronics, piping, sheet metal, insulation, laminating, carpentry, painting, sand blasting, welding and machining, as all these trades are accomplished as part of yard operation and are not subcontracted.
Test Cell for assembly and testing of gas Turbine Generator Sets.

STORAGE SPACE (Sq. ft.) FOR COMPONENTS AND MATERIALS (Less boat storage) (List dimensions for each area, plus type material stored)

23 x 34; 19 x 30; 50 x 67; 33 x 95;
38 x 52; 123 x 130; 133 x 140; 133 x 140;
62 x 136; 34 x 99; 60 x 150; 60 x 150;
60 x 150; 80 x 160; 100 x 290; 50 x 150;
104 x 122; 30 x 62; 70 x 90; 83 x 105;
90 x 148; 40 x 60.
Total Square Feet: 196,424 Sq.Ft. Warehousing space.

NOTE: With our product mix we use the warehouses for all different material - depending on Contracts.

RAW STEEL STORAGE (Sq. ft.)	WELDING AND ASSEMBLY (Sq. ft.)
22,400	112,120

ACREAGE LEGALLY CONTROLLED

IN USE	DEVELOPED (Including in use)	TOTAL (Including undeveloped)
16	26	42

EXISTING LOCAL ORDINANCES LIMITING PRODUCTIVE USE

NONE

LIMITATIONS IMPOSED BY PROPERTY ZONING CLASSIFICATION

NONE

YARD LAYOUT—PLEASE FURNISH A PLOT PLAN OF YARD OR PLANT, IF AVAILABLE

LOCATION OF PRODUCTION FACILITIES FOR PRODUCTS LISTED IN ITEM 11, OF STD. FORM 129 | ON WATERFRONT [ ] Yes [ ] No

EMPLOYMENT	CURRENT	CURRENT NO. SHIFTS	MOBILIZATION--SHIFTS	
Management, administration	81	1		
Professional, engineering	56	1		
Professional, technical (*All others*)	49	1		
Production, skilled	488	1 (Partial 2nd shift)		
Production, semiskilled	116	1 (Partial 2nd shift)		
Production, unskilled	132	1 (Partial 2nd shift)		
Nonproduction	73	1 (Partial 2nd shift)		
Total	995	x x x x x x		x x x x

NUMBER OF PRODUCTION PERSONNEL PRESENTLY ENGAGED IN SHIP AND/OR BOAT CONSTRUCTION: 624

IN SHIP OR BOAT REPAIR

APPROXIMATE TOTAL EMPLOYMENT OF ALL AFFILIATED CONCERNS ONLY LISTED IN ITEM 8, OF STD. FORM 129 (*NOTE.* An affiliate is a concern that directly, or indirectly through one or more intermediaries controls, or is controlled by, or is under common control with, the reporting firm. Common ownership of stock by individuals does not in itself, constitute affiliation.)

DISTANCE TO NEAREST RAILROAD CONNECTION

20 miles

DISTANCE TO NEAREST AIRPORT—IDENTIFY

3 Mi. Cherryland Airport
Sturgeon Bay, WI
45 Mi. Austin Straüble Airport
Green Bay, WI

LARGEST CONVEYANCE AVAILABLE AND MAXIMUM DIMENSIONS OF LOAD, FOR OVERLAND TRANSPORTATION OF FINISHED PRODUCTS (*Not to exceed limitations imposed by local ordinances*)

Up to 65' long x 16' high x 19' wide, by truck.
Ship delivery World wide - 436 ton at our dock face.

NAVIGATIONAL RESTRICTIONS (INDICATE ALL AT M.L.W.)

MINIMUM CHANNEL TO TIDEWATER

24 feet deep

MINIMUM HORIZONTAL AND VERTICAL BRIDGE CLEARANCES TO TIDEWATER (*Identify structures.*)

115 feet

LIMITING LOCK DIMENSIONS TO TIDEWATER (*Identify locks.*)

76'6" x 730' O.A. - Welland Canal and St. Lawrence Seaway

PROJECTS UNDER CONSTRUCTION WHICH WILL ALTER NAVIGATIONAL RESTRICTIONS (*Specify projects and state effect and estimated completions.*)

DESCRIPTION OF TYPES OF WORK NORMALLY SUBCONTRACTED

PRODUCTION EXPERIENCE (List at least three of the largest and the most complex ships or boats constructed, indicating (1) date completed, (2) hull length, beam, and molded depth, (3) type propulsion unit (fully described), (4) horsepower, (5) electrical and/or electronic installation, (6) special piping features, (7) size and tensile strength of plates, if steel, or type hull material, if other than steel, (8) special annealing, heat treating, or stress relieving problems encountered, if steel, plus, (9) any other important problems resolved). (NOTE.—If no previous construction experience give detailed description of major conversion or industrial manufacturing work considered comparable to ship or boat construction.)

QTY	TYPE	SIZE	TOTAL HP	HULL	CONTRACT NO.	COMPLETED
5 -	(PGM) Patrol Boats	101'x21'x7'7"	2000	Steel	NObs 4779	1965
7 -	Utility Boats	45'x12'10"x3'	500	Steel	NObs 4802	1965
3 -	(PGM) Patrol Boats	101'x21'x7'7"	2000	Steel	NObs 4830	1965
27 -	Personnel Boats	33'x11'4"x4'	250	Plastic	NObs 4835	1967
2 -	Minesweepers (non-magnetic)	145'x26'x8'	1000	Wood	NObs 4861	1967
4 -	Minesweepers (non-magnetic)	111'x23'5"x8'	1000	Wood	NObs 4875	1967
6 -	(PGM) Patrol Boats	101'x21'x7'7"	2000	Steel	NObs 4892	1966
12 -	LARC Amphibious Vehicles	63'x28'x8'2"	1120	Steel	U.S. Army	1967
1 -	(PGM) Patrol Boats	101'x21'x7'7"	2000	Steel	NObs 4979	1966
19 -	Personnel Boats	33'x11'4"x4'	250	Plastic	NObs 18A	1968
5 -	(PG) Patrol Gunboats	165'x23'10"x5'2"	13,000	Alum.	N00024-67-C-0201	1969
6 -	(PGM) Patrol Boats	100'x21'x7'7"	2000	Steel	N00024-67-C-0221	1967
2 -	(TR) Torpedo Retrievers	65'x17'x3'10"	800	Alum.	N00024-67-C-0264	1967
4 -	Minesweepers (non-magnetic)	145'x27'x8'	1000	Wood	N00024-67-C-0303	1968
4 -	(TR) Torpedo Retrievers	65'x17'x3'10"	800	Alum.	N00024-67-C-0399	1968
6 -	(PGM) Patrol Boats	101'x21'x7'7"	2000	Steel	N00024-68-C-0309	1969
2 -	(TWR) Torpedo Weapons Ret.	102'x21'x7'9"	2050	Steel	N00024-68-C-0375	1969
1 -	GRP Minesweep TestSection	68'x28'x9'	--	Plastic	N00024-68-C-5276	1969
3 -	(PGM) Patrol Boats	101'x21'x7'7"	2000	Steel	N00024-69-C-0288	1970
6 -	(YTB) Harbor Tugs Large	109'x30'x13'7"	2000	Steel	N00024-69-C-0280	1970
7 -	(YTB) Harbor Tugs Large	109'x30'x13'7"	2000	Steel	N00024-70-C-0301	1971
20 -	(UB) Utility Boats	40'x12'2"x3'8"	165	Plastic	N00024-70-C-0294	1972
1 -	(R/V) Research Vessel	244'x50'14"	1600(elec)	Alum.	ALCOA	1971
11 -	(UB) Utility Boats	33'x11'3"	100	Plastic	N00024-71-C-0241	1972
139 -	Bridge Erection Boats	27'x5'x2'	184	Alum.	Sub Contract for ALCOA	1974
12 -	Personnel Boats	32'x11'4"x4'	250	Plastic	N00024-71-C-0285	1972
1 -	Torpedo Weapons Retriever	102'x21'x7'9"	2050	Steel	N00024-71-C-0305	1972
7 -	(UB) Utility Boats	40'x12'2"x3'8"	165	Plastic	N00024-72-C-0240	1972
1 -	2000 T Purse Seiner	262'x45'x19'6"	6000	Steel	MARGE.L. INC.	1972
1 -	Ferry Boat	235'x57'x13'6"	4300	Steel	State of Alaska	1974
2 -	Minesweepers (non-magnetic)	145'x27'x8'	1000	Wood	N00024-73-C-0271	1975
11 -	(PB) Patrol Boats	65'x18'x5'	1800	Alum.	N00024-73-C-0300	1976

* U. S. GOVERNMENT PRINTING OFFICE: 1966 O - 210-630

Con't page 6A

PRODUCTION EXPERIENCE (List at least three of the largest and the most complex ships or boats constructed, indicating (1) date completed, (2) hull length, beam, and molded depth, (3) type propulsion unit (fully described), (4) horsepower, (5) electrical and/or electronic installation, (6) special piping features, (7) size and tensile strength of plates, if steel, or type hull material, if other than steel, (8) special annealing, heat treating, or stress relieving problems encountered, if steel, plus, (9) any other important problems resolved). (NOTE.—If no previous construction experience give detailed description of major conversion or industrial manufacturing work considered comparable to ship or boat construction.)

QTY	TYPE	SIZE	TOTAL HP	HULL	CONTRACT NO.	COMPLETED
1 -	Fire/Rescue Boat	40'x11'6"x3'6"	560	Steel	City of Chicago	1974
1 -	Tug/Tow Boat	95'x30'x11'	1700	Steel	Twin City Barge	1974
20 -	Sailboats (Standfast 36)	36'x12'x6'9"	25	Plastic	Palmer Johnson, Inc.	1974
1 -	Floating Mammal Pavilion	180'x54'x8'	--	Steel	New England Aquarium	1973
2 -	(R/V) Research Vessels	177'x33'x17'6"	2800	Steel	Woods Hole Oceanographic Institute	1975
1 -	Patrol Boat	42'x11'6"x3'6"	560	Alum.	Arvandan Maritime Co	1974
10 -	Patrol Boats	50'x15'x4'	850	Alum.	Arvandan Maritime Co	1975
1 -	Notch Tug - Ocean	144'x45'x25'	7000	Steel	CF Industries	1977
1 -	(R/V) Research Vessel	177'x33'x17'6"	2800	Steel	University of RI	1976
1 -	(M/V) Ferry Boat	235'x57'x13'6"	4300	Steel	State of Alaska	1977
12 -	(PB) Patrol Boats	65'x18'x5'	1800	Alum.	N00024-75-C-2097	1977
4 -	(MSC 322 Class Minesweepers	152'x27'x8'	1200	Wood	N00024-75-C-2150	1979
6 -	(FPB) Patrol Boats MK-II	50'x15'x4'	850	Alum.	Arvandan Maritime Co	1976
2 -	Roll ON/Roll Off Cargo Ship	300'x55'x27'	5600	Steel	American Heavy Lift Co.	1979
*9 -	PGG Patrol Gunboats	190'x27'x14'	23,000	Alum.	N00024-77-C-2047	Under Const.
3 -	YP Patrol Craft	80'5"	340 SHP	Wood	N00024-77-C-2068	1979
3 -	Tuna Purse Seiners	224'	3550 SHP	Steel	Ocean Blazer	1980
8 -	(PB) Patrol Boats	65'	1800	Alum.	N00024-77-C-2124	1979
*3 -	Tuna Purse Seiners	45'x224'x17'6"	3550 SHP	Steel	Tuna Fleet Mgt.	Under Const.
* 1 -	PGG Patrol Gunboat(511)	190'x27'x14'	23,000	Alum.	N00024-77-C-2047	1980
* 1 -	PGG Patrol Gunboat(513)	190'x27'x14'	23,000	Alum.	N00024-77-C-2047	1981
* 1 -	PGG Patrol Gunboat(515)	190'x27'x14'	23,000	Alum.	N00024-77-C-2047	1981
* 1 -	PGG Patrol Gunboat(517)	190'x27'x14'	23,000	Alum.	N00024-77-C-2047	1981
* 1 -	PGG Patrol Gunboat(519)	190'x27'x14'	23,000	Alum.	N00024-77-C-2047	1981
1 -	Tuna Purse Seiner	224'	3550 SHP	Steel	Red Star, Inc.	Under Const.
**2 -	Tuna Purse Seiners	45'x224'x17'6"	3550 SHP	Steel	Tuna Fleet Mgt.	1981

NOTE: CONTRACTS PRIOR TO 1965 ARE NOT INCLUDED. *Five of the respective (9) Patrol Gunboats were delivered in 1980 and 1981 respectively. **Two of the respective (3) Tuna Seiners were delivered in 1981.

3 -	ARS-50 Rescue/Salvage	255'x51'	4200 SHP	Steel	N00024-81-C-2022	Under Const.

* U. S. GOVERNMENT PRINTING OFFICE : 1966 O - 310-638

FLOATING DRYDOCK CHARACTERISTICS SUMMARY

FLOATING DRYDOCK	MAXIMUM LENGTH OF PONTOON	MAXIMUM DEPTH OVER BLOCKS	CLEAR WIDTH BETWEEN WINGWALLS	LIFT CAPACITY (TONS)	NORMAL KEEL BLOCK HEIGHT	A.C. AMPERES (60HZ-3ϕ)			REMARKS (Indicate existence of hauling blocks, if end section can be lowered, and max length of ship DD can accommodate.)
						480V MAX. HOTEL (INDUS)	2400V ALT HOTEL	13.2 KV TEST/ CHECK	
No. 39 374' O.A.L. Steel Dry Dock	360'	14'	40'	1800	36"				